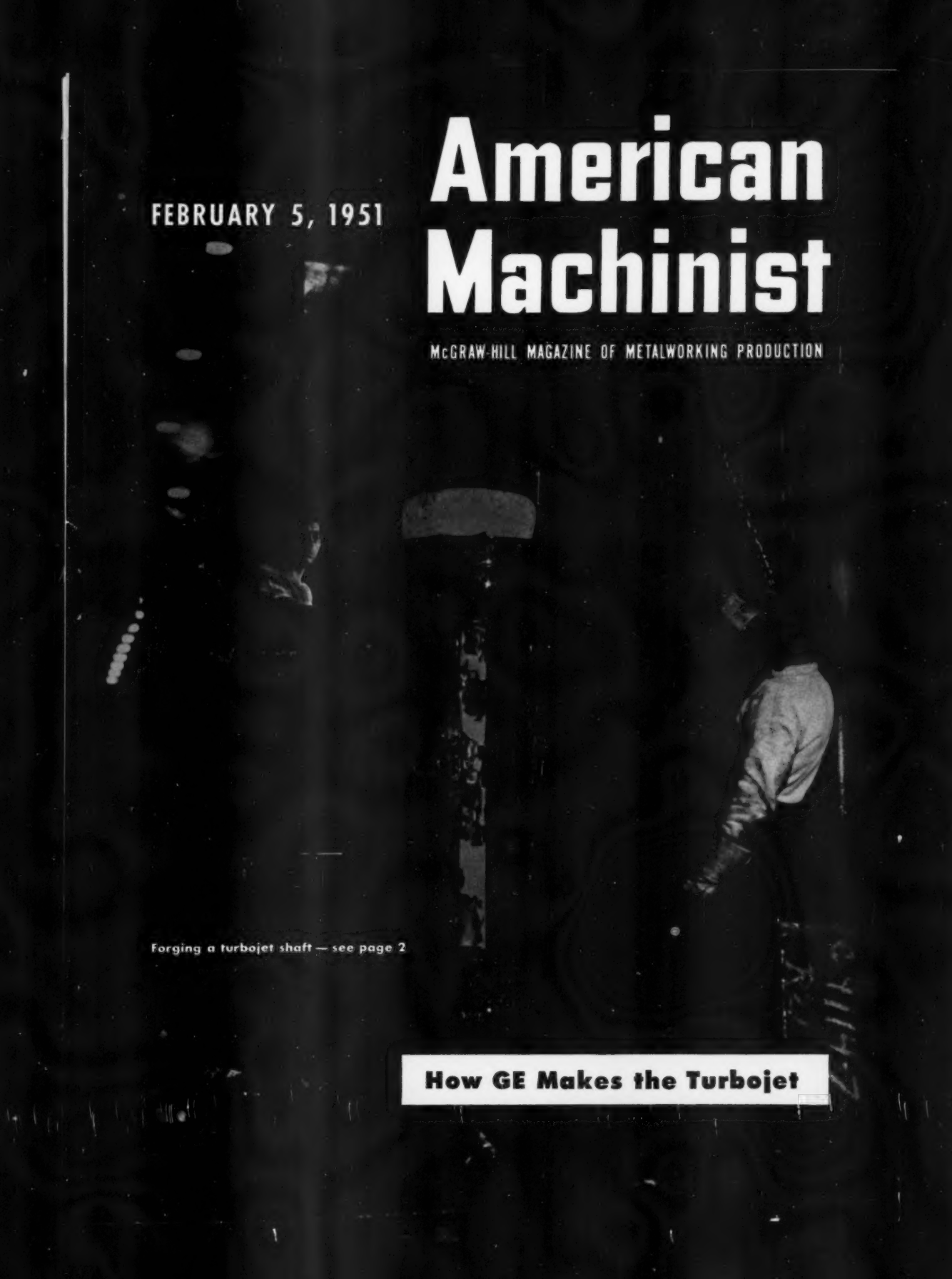
FEBRUARY 5, 1951

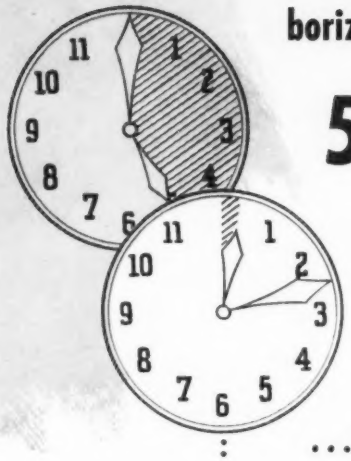
American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



Forging a turbojet shaft — see page 2

How GE Makes the Turbojet



borizing time CUT FROM

5 hours

to 12 minutes

per piece !

...with a new, double-end Heald Bore-Matic

By performing many different operations in one high-speed, automatic cycle, the Heald Model 322 Bore-Matic shown below actually saved 4 hours and 48 minutes on each part.

On this machine, gear case covers for diesel engines are bored, faced, chamfered and turned with but a single set-up. As this job formerly required separate operations on different machines, the saving in set-up and handling time was tremendous.

A total of four boringheads are used — one on the left-hand bridge, and three on the right. The work, clamped to an angle-plate fixture, is automatically presented to the two sets of heads in sequence, after which it returns to center for reloading.

The amount of time that you can save with a new Heald machine is a measure of the time now being lost through out-dated equipment and methods. How much is this "lost time" — and what is it costing you in terms of production efficiency? Your nearest Heald representative will be glad to study your finishing operations and give you the answer — wthout obligation. Remember — when it comes to precision finishing, it pays to come to Heald.

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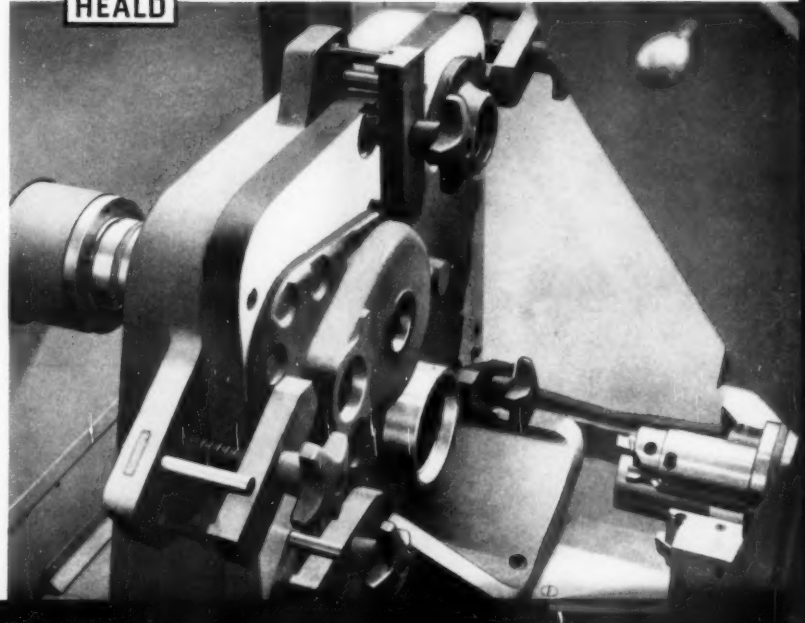

Heald Model 322 Bore-Matic, showing multiple tooling and clamping fixture for borizing gear case covers in a single set-up.

American Machinist

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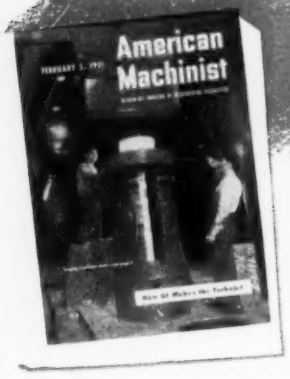


Chips and QUIPS

Disk Forging . . . Forge shops are hard places in which to take Kodachromes. If you have light enough, the work looks cold; if you don't, you can't see anything. Thus the good picture of a forging operation is rare. But we wanted you to see how GE forges the integral shaft and turbine disk for a turbojet.

The billet is first forged to a shaft with heavy collar at one end. Then it is reheated and placed upright in a socketed fixture so the collar can be forged into the disk. Here the disk is about half formed, and the piece must be reheated before completion. The piece is obviously below forging temperature—posing and lighting take time. Jim Burns took the photo.

Very Special Report . . . In mid-November, the Air Forces permitted General Electric Co to invite a selected group of editors and reporters to visit the Aircraft Gas Turbine plant in Lynn and Everett, Mass. You've probably seen the press-release stories from that visit. We felt, however, that there was much more to see and to talk about in this plant.

General Electric was happy to cooperate, so two editors spent a week collecting data and supervising photographs, assisted by countless foremen, general foremen and the superintendents of the buildings concerned. The result is our current Special Report, rushed through special checking and clearances by GE, the Air Forces, the Department of Defense, and the Munitions Board. It is the first detailed story of turbojet production, and shows dozens of manufacturing tricks that can be applied elsewhere. This is no step-by-step sequence, but a selection of the unusual and broadly applicable.

Incidentally, the work was begun the weekend after Thanksgiving and the accompanying storm, and Ashburn was so rushed making the train that he failed to shift from loafers to regular shoes—perhaps the first recorded instance of an editor spending a week on the job in house slippers.

Quality and Layout . . . R. W. Mallick of Westinghouse, whose name will be familiar to many readers, is scheduled to emerge as a book author this month. From the book-to-be we have a story on how quality control affects plant layout—general facilities that influence quality, layout of the receiving-inspection area, gage rooms, in the line, and in test areas . . . We have a Westinghouse "short" on drilling hardened steels.

CI Machining . . . G. W. Halston, of De Laval Steam Turbine Co., has put together for you the results and conclusions of a series of tests he's made to develop best cutting practice for cast iron. Much of this information is badly needed—and hard to come by.

Multi-Coat . . . Recently, abrasive-disk makers have developed the multi-coated type, really a heavy-duty disk for production work. E. W. Farmer, of Bay State Abrasive Products, puts together the pros and cons on the new disks.

Sub-Contractors Beware . . . Karl Kirchhofer, who during World II operated a plant on many sub-contracts, has put together for small-shop men the features in contracts that should be watched. Security provisions, overages and shortages, overtime, inspection, loan of equipment, drawing changes, and payment procedures.

Coming . . . Feb. 19 *AM* will have an unusual cover—familiar machine tools with an unfamiliar look. They're machines shrouded to remove toxic products in machining beryllium. We'll have an article, too, on machining radioactive and toxic materials. There'll be a Special Report on automatic chuckers, articles on high-speed turning, carbon restoration in screws, Canadian apprenticeship methods, and on brazing a shotgun assembly.

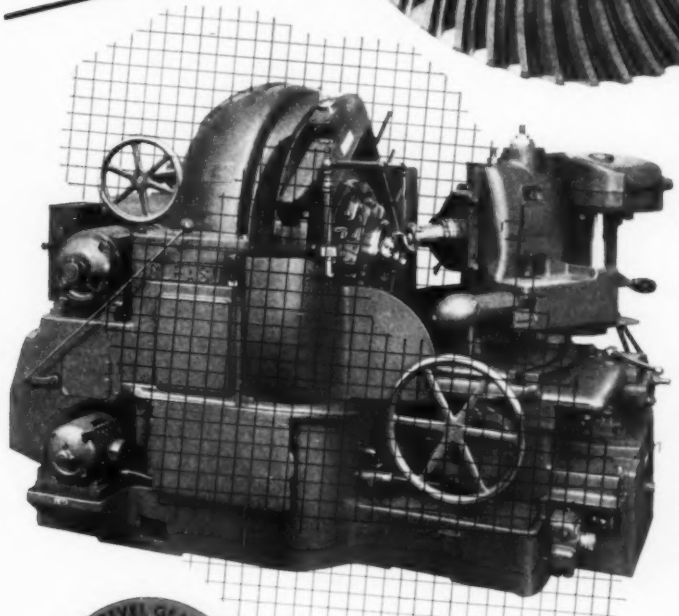
INDUSTRIAL ENGINEER . . . George W. Halston has had more than 15 years professional experience with five different consulting firms. Formerly of Chicago, he came to De Laval Steam Turbine Co. in 1946, as a consultant, for the purpose of establishing standard time on operations. He immediately started metal-cutting tests to determine the economical standard time during machining cycles. These tests proved that tool use could be increased with economical tool life, resulting in production increases in some instances of 300%. He selected and trained the personnel for De Laval's Work-Measurement Department and joined the Company in 1949 as supervisor of the group. He has described his results on metal-cutting tests for this issue.

SPIRAL BEVELS

FOR SMALL QUANTITY PRODUCTION

ONLY **1** GLEASON MACHINE REQUIRED

FOR JOBBING SYSTEM USING
16° PRESSURE ANGLE
35° SPIRAL ANGLE



ADVANTAGES

1. Choice of length of tooth bearing
2. Fast cutting with multi-blade cutters
3. Long-lived cutters, simple to adjust
4. Fewer calculations than any other method
5. Easier and more direct set-up of both cutters and machine
6. More gears per cutter than from any other method

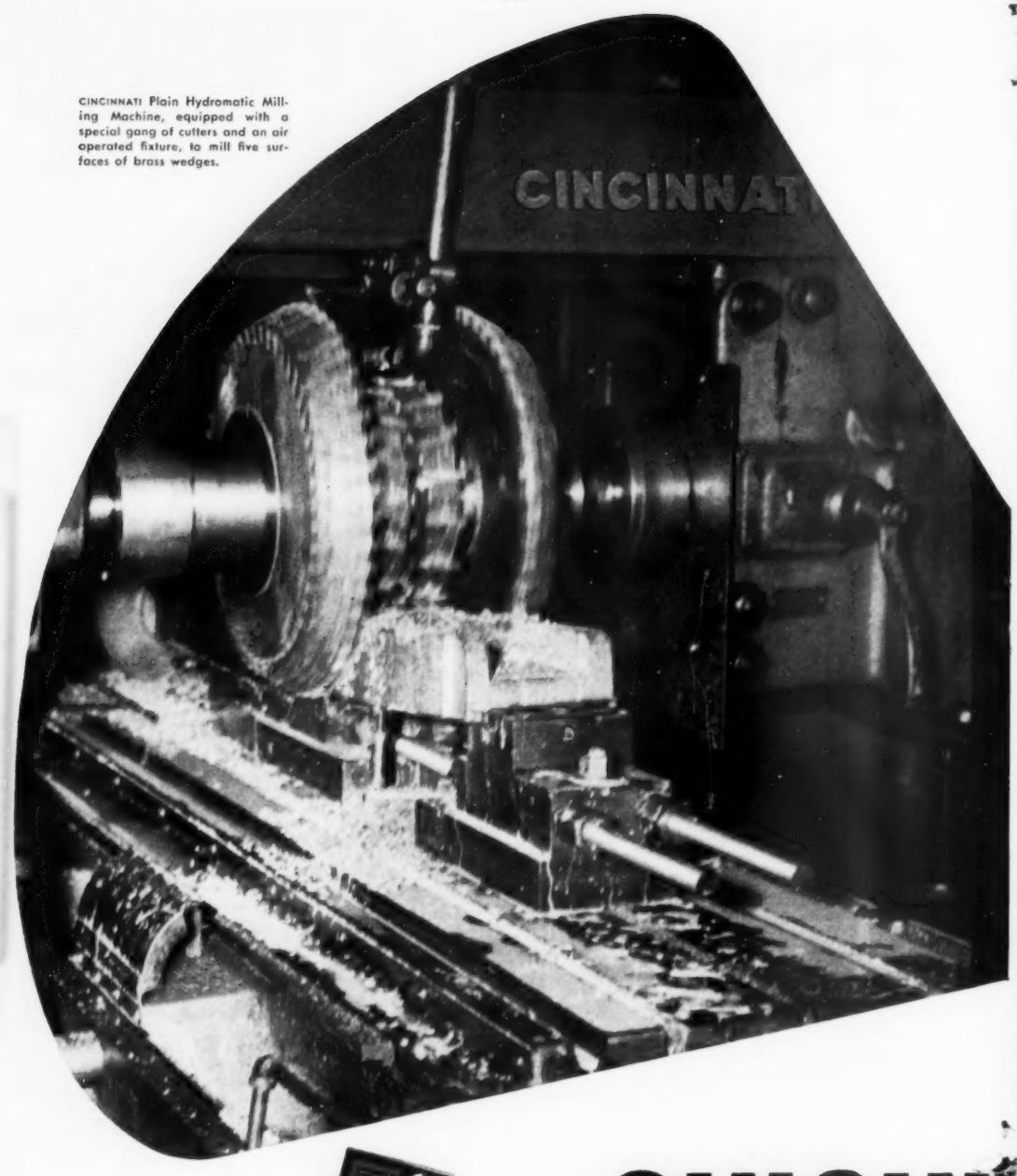
Investigation will prove that it is less expensive to produce any quantity, from a single pair to any number in mass production, on Gleason Machines than by any other method.

Ask about the Gleason jobbing system.

GLEASON NO. 16
HYPOID GENERATOR

GLEASON WORKS
100 UNIVERSITY AVENUE • ROCHESTER 3, NEW YORK

CINCINNATI Plain Hydromatic Milling Machine, equipped with a special gang of cutters and an air operated fixture, to mill five surfaces of brass wedges.



Write for catalog No. M-1670 for the Plain and Duplex machines. Or catalog No. M-1602 for the Plain and Duplex Tracer Controlled Hydromatics.

CINCIN

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES

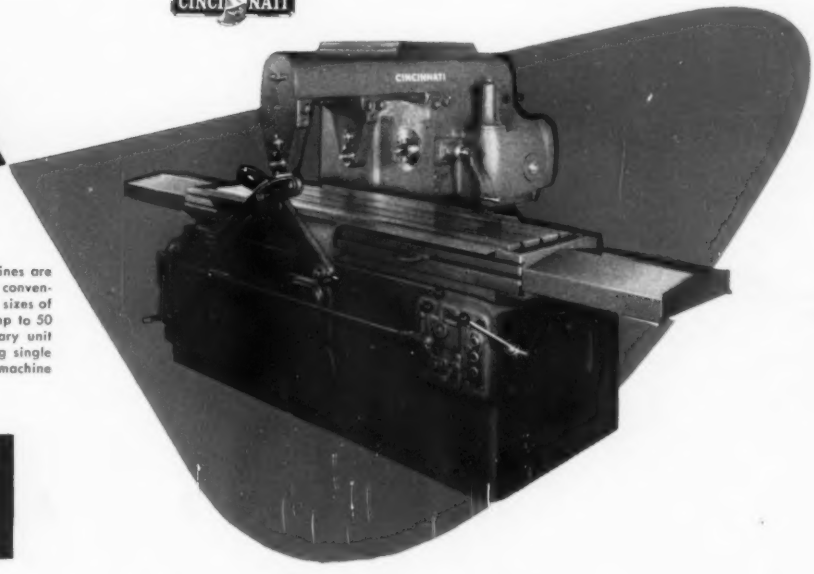
"Ganging Up" FOR MULTIPLE CUTS

DOUBLES PRODUCTION OF WEDGES

Why take five cuts, when one will do the job? That must have been the question asked of themselves by the shop personnel of the Southern Pacific Company, for they designed a gang of five large cutters to mill five surfaces of locomotive brass wedges in one pass. Production jumped to double the previous method. ¶Of course, there's one little catch to the practice of combining cuts—you need a machine that can take the load. In this example, a CINCINNATI Plain Hydromatic Milling Machine provided all the power and stamina required for the heavy cutting operation. There are several reasons for Hydromatic's high degree of cutability: heavily proportioned castings throughout . . . up to 50 hp drive . . . Dynapoise vibration damping overarm . . . only four gear contacts in spindle drive. There are many other reasons why Hydromatics can cut metal so quickly. Attractive catalogs give you the complete story.

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

CINCINNATI



CINCINNATI Hydromatic Milling Machines are available in Plain and Duplex styles, conventional and tracer controlled types, 18 sizes of each, 24" to 90" table traverse, 10 hp to 50 hp drive, standard and complementary unit construction for flexibility in building single purpose machines. No. 5-60 Plain machine illustrated.

NATI

FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

Control OF
GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS
PLASTICS MOLDING MACHINES

PRECISION REGISTER IN A 'PRINTER-SLOTTER'

The latest Langston 42 x 94 'Printer-Slotter' for shipping containers.

The 'Printer-Slotter' shown prints in 2 colors, scores and slots a blank of corrugated board.

...dependably sure with Fellows-cut Gears

Exact synchronism of multiple rollers as to speed, micro-accurate register and alignment, depends largely upon the absolute precision of the driving gear trains. Manufacturers of such machinery, therefore, logically set the closest of limits for such gears. The availability of the Fellows 36-Type Gear Shaper is important, for it gives them the needed control of (1) quality — with much-appreciated extra advantages in (2) speed and (3) all-purpose adaptability.

All these are realized by Samuel M. Langston Company who cut all types of gears, helical and spur, on the two 36-Type Fellows Machines illustrated here. All work is held to limits which safeguard the quality reputation of the various Langston paper working machines.

With gears in such variety to cut, the shop schedule profits in the time-saving of quick change-over. This feature of the 36-Type machine centers in convenient lever-shift change gears, dial set feed changes and simple push button controls. If you are interested in new cost economies in cutting precision gears in sizes up to 36" p.d. investigate the latest "36-Type."

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
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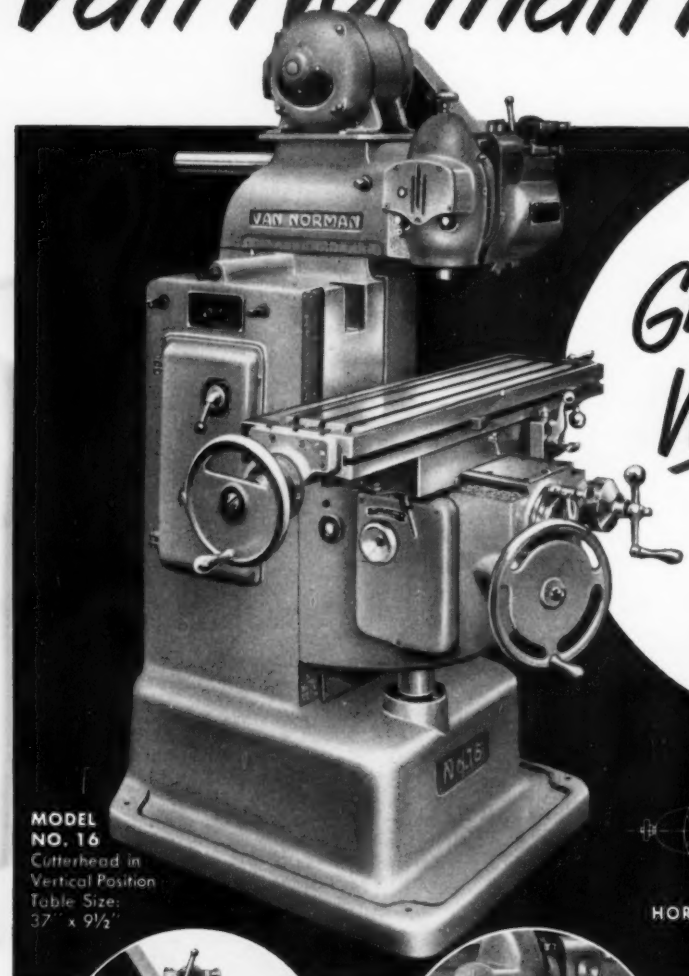
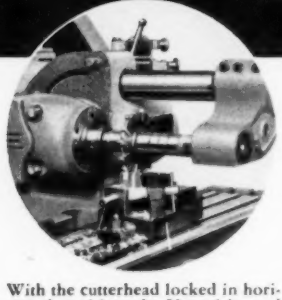
Van Norman No. 16



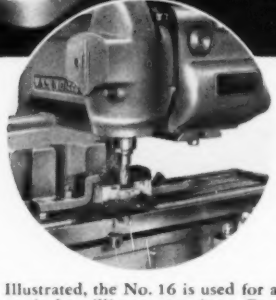
Gives You the Workability of Three Machines

MODEL NO. 16
Cutterhead in Vertical Position
Table Size:
37" x 9½"

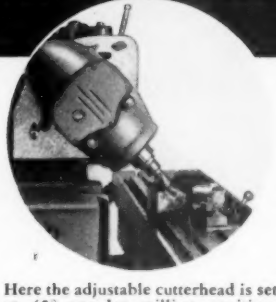
HORIZONTAL VERTICAL ANGULAR



With the cutterhead locked in horizontal position, the No. 16 is used for horizontal milling operation. Hardened stop set at factory assures positive 0° setting.



Illustrated, the No. 16 is used for a vertical milling operation. Permanently fixed hardened stop permits easy, accurate positioning of the cutterhead at 90°.



Here the adjustable cutterhead is set at 45° angular milling position. Horizontal, vertical, or angular milling all are easily performed on the No. 16 Miller.

Ram Type Miller

Here's a miller so versatile that it enables you to perform any and every milling job from horizontal to vertical . . . simply by positioning the adjustable cutterhead which is mounted on a movable ram. Why do you benefit . . . because with this one machine you have the work range of several single purpose millers. This enables you to keep the Van Norman miller working all the time . . . also many jobs can be carried through to completion without changes in the workpiece setup — saving time and reducing errors.

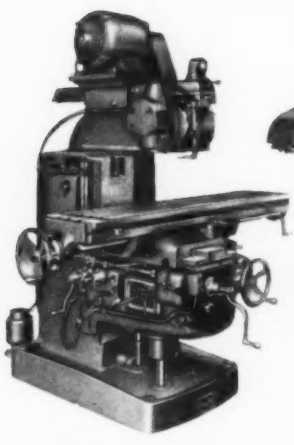
The Van Norman No. 16 Ram Type Miller gives you these additional advantages —

Conveniently grouped controls in front of knee makes operations easy. Power feeds are selected with a quick change feed selector. Large, easy-to-read dials.

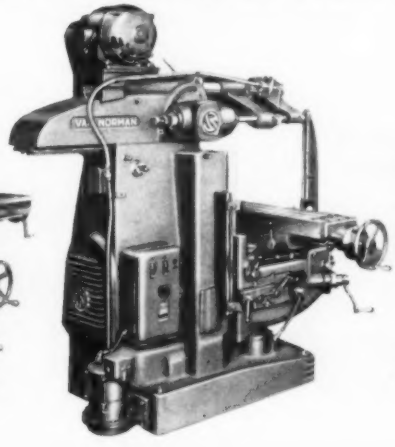
Built-in electric controls simplify operation. Single lever selector controls spindle, feed and coolant. Push-button, on front of knee, starts and stops motors as pre-selected.

Rugged base and column, massive cutterhead, large ram and heavy knee, saddle and table assembly provide maximum rigidity and long life accuracy.

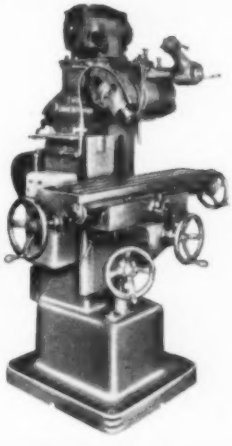
OTHER VAN NORMAN RAM TYPE MILLERS THAT REDUCE PRODUCTION COSTS



MODEL NO. 38
Cutterhead in Vertical Position
Table Size: 64" x 14"

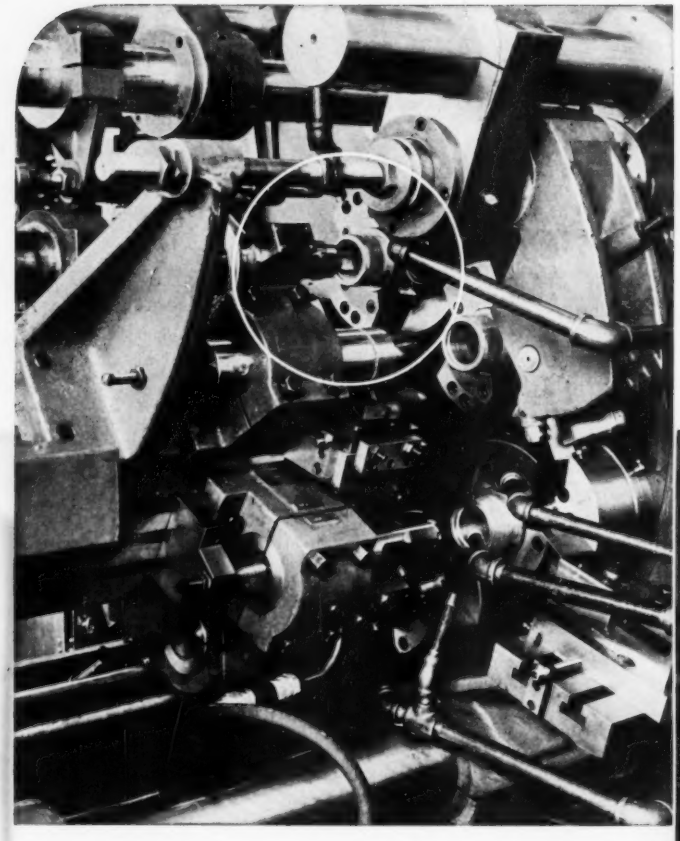


MODEL NO. 22L
Cutterhead in Horizontal Position
Table Size: 45" x 10"



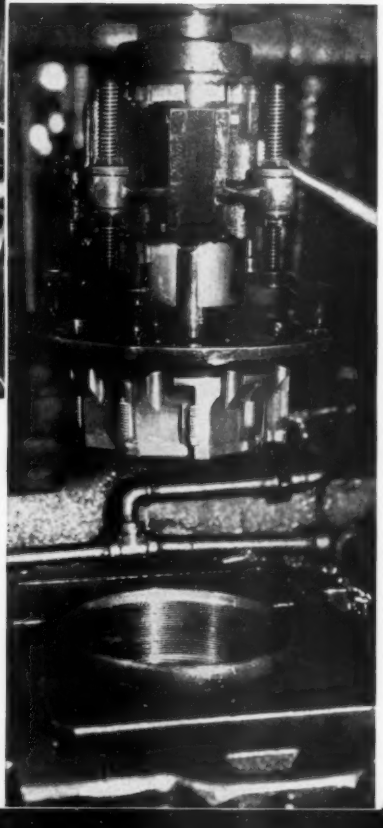
MODEL NO. 12
Cutterhead in Angular Position
Table Size: 37½" x 9 3/16"

VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS

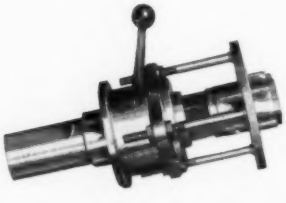


MANY WITH

DETACHABLE



LL Receding Chaser Collapsible Tap arranged for use as a Rotary Tap



ALT Collapsible Tap arranged for use as a Stationary Tap.

The LANDIS *Machine* COMPANY

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF

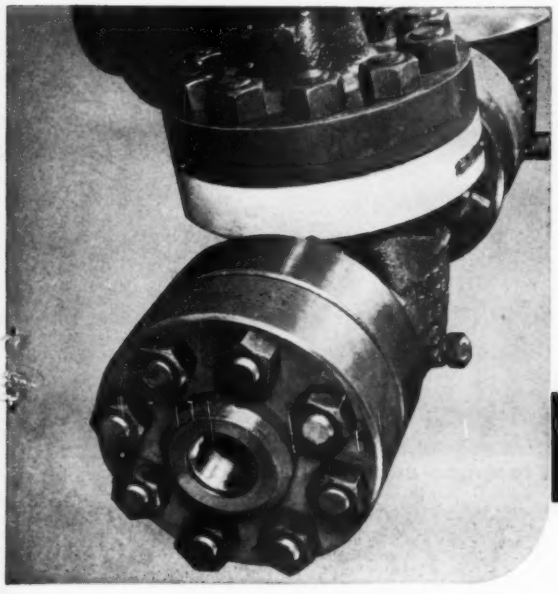
THREAD DIAMETERS ONE LANDIS TAP . . .

HEADS CUT WIDE RANGE OF INTERNAL THREADS

The LANDIS Collapsible Tap is a many-purpose tool—yet a single-purpose tool. The versatility of the LANDIS Tap enables it to handle a wide variety of jobs—yet it handles each job as though it were a specially-designed tool.

WIDE THREAD CAPACITY

The ability to cut thread diameters of varying sizes is an outstanding feature of all LANDIS Taps. The thread-cutting head is detachable and tap heads of various sizes and capacities can be used interchangeably on the same tap body. This design makes it possible to cut an unusually-wide range of internal thread sizes with a minimum tool investment. For instance, the 5ALT Tap will cut threads from 1⅝" to 6⅝" in diameter.



EASY REMOVAL FROM WORK

LANDIS Taps are constructed with a built-in **collapsing** action. Chasers drop free from the work into the tap head at the completion of the thread. The tap can be removed directly without "backing out," thus saving labor time and chaser wear, and reducing the number of torn threads.

INTERNAL TAPERED THREADS

LANDIS Taps are of two types—the ALT for parallel threads—and the LL for tapered threads. The LL Receding Chaser Collapsible Tap is especially designed to cut API Standard threads in any machineable material well within all required tolerances. This tap features a new receding action—a fulcrumed lever—which gives a positive receding movement to the chasers and allows precision thread tapers. The low cutting strains thus obtained lengthen chaser life and improve thread accuracy and finish.

GENERAL FEATURES

LANDIS Taps can be used as stationary or rotary taps, and can be quickly converted from one type to the other. Left-hand threads may be cut with the same tap bodies, using left-hand tap heads. All taps have a fine size adjustment which allows compensation for wear and regrinding, and the style LL Tap can be adjusted to compensate for slight errors in taper.

Consider the money-saving features of LANDIS Taps in cutting internal threads in your plant. Write for Bulletins G-94 and G-95.

LANDIS TRADE MARK

WAYNESBORO PENNA., U. S. A.

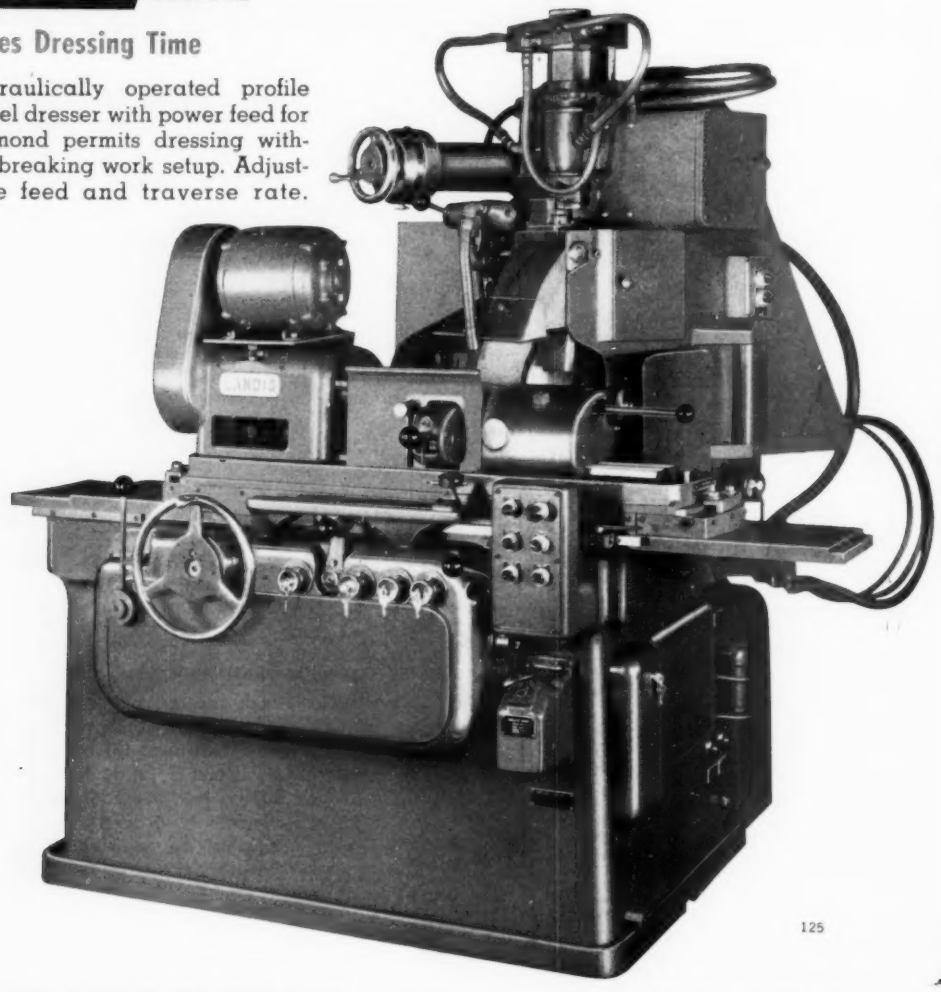
THREAD GENERATING EQUIPMENT

Reduce Precision Grinding Costs by

NEW FEATURE

Saves Dressing Time

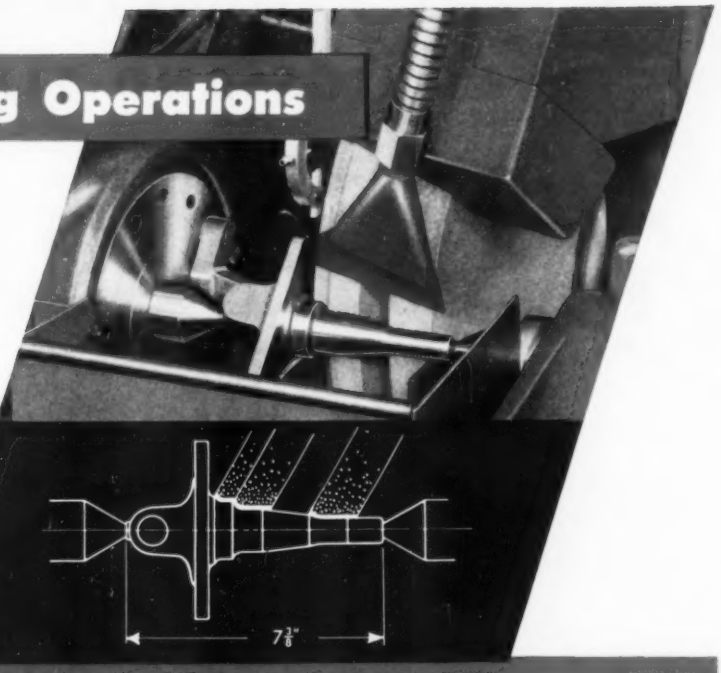
Hydraulically operated profile wheel dresser with power feed for diamond permits dressing without breaking work setup. Adjustable feed and traverse rate.



LANDIS TOOL
Precision Grinders

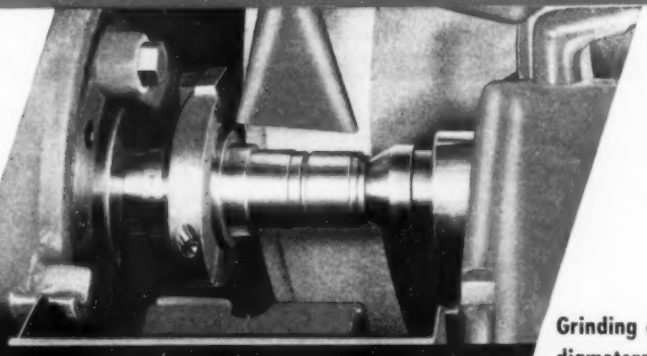
Type CH Plain Cylindrical Grinder with wheel base set at 30° angle. Grinds face and diameters in one operation.

Combining Operations

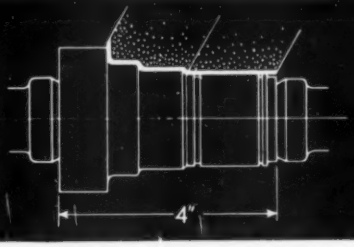


Grinding 3 diameters and 3 blending radii in one operation.

with Angle Wheel Base Grinder



Grinding a face and 3 diameters in one operation.



Production estimates and tooling suggestions made without obligation if blueprints are submitted of work pieces.

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

WHERE PART PRODUCTION DOES INDIVIDUAL JIGS AND FIXTURES

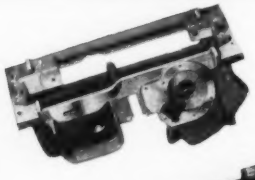
NEW G&L MEDIUM DUTY MACHINE

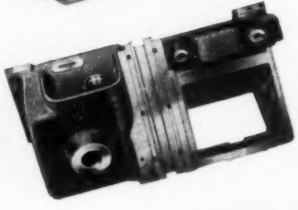
RAPIDLY PERFORMS PROFILE MILLING, DRILLING, TAPPING AND PRECISION BORING OPERATIONS ON IMPORTANT TRANSMISSION GEAR CASE

Costly fixtures for handling various machine and equipment components can be eliminated when the new G. & L. 300 series machine is used for vital precision machining operations. The problem of producing parts to meet delivery schedules is greatly reduced by placing work on this flexible, high-speed machine. No time is lost in tooling up for a job requiring only a minimum number of parts. Work is placed directly on the machine for a wide range of operations. These are performed quickly and easily, for G. & L. machines are designed to complete work at high rates of speed. Or should your work be large and awkward, the versatility of this machine makes it possible to handle such jobs as the parts illustrated with equal efficiency.

You Can Solve Production Problems Easier

...call in experienced Giddings & Lewis engineers who will be glad to submit correct machining recommendations. There is no obligation for this service.



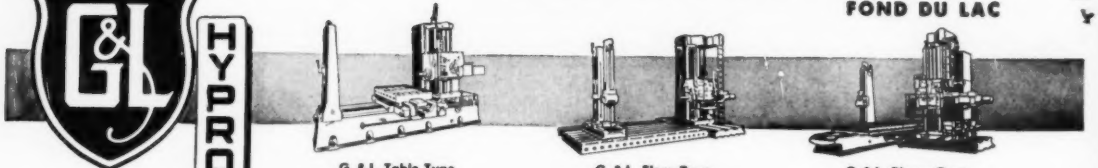


Check These Complicated Parts Machined Without Fixtures on a G. & L.

More than 75 contour milling, drilling, boring, reaming, tapping, slotting and back facing operations are completed as this casting is indexed on a simple, trunnion-type holding block. Providing jigs and fixtures for such a complicated part in the limited quantity needed proved too costly and time consuming. Yet, complete machining was standard and accepted work for a G. & L. Your own similar machining problems may be as easily solved with advanced G. & L. machines.

GIDDINGS & LEWIS
FOND DU LAC

G&L HYPRO



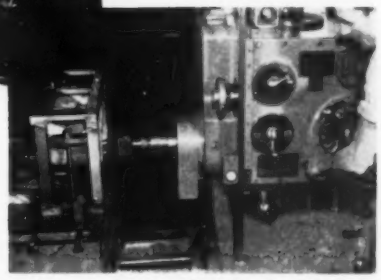
G. & L. Table Type Horizontal Boring Machine

G. & L. Floor Type Horizontal Boring Machine

G. & L. Planer Type Horizontal Boring Machine

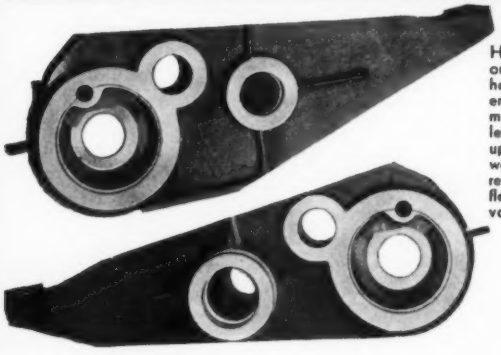
NOT WARRANT

Designed for high speed machining, this new G. & L. 300-T machine has a speed range from 7 to 1600 R.P.M. and a feed range (inches per rev.) of .0012-.125. Numerous advanced features such as pendant control, simple direct reading dials, built-in scales and verniers, and conveniently located operating levers make this machine valuable wherever progressive machining practices are followed.



Operating convenience lessens worker fatigue adding to productive output. Here a transmission case casting is being bored.

Photograph Courtesy Armstrong-Blum Mfg. Co., Chicago, Ill.

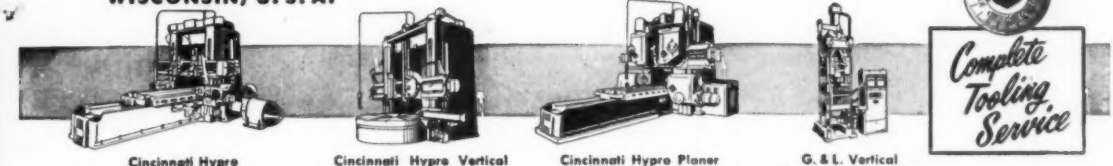


Here is a different type of gear case machined on a G. & L. Bore center distances are readily held to ±.0004". In this instance, precision end measures and dial indicators are used, making it possible to obtain tolerances equivalent to those of a jig borer. You can depend upon a Giddings & Lewis machine to perform work to required limits and at the same time receive the multiple advantages of machine flexibility and versatility in producing a broad variety of parts.

Alignment of bearing bores are held to ±.0005" without difficulty, thus insuring proper meshing of gear train when this transmission is assembled.

MACHINE TOOL COMPANY

WISCONSIN, U. S. A.



Cincinnati Hypro Double Housing Planer

Cincinnati Hypro Vertical Boring and Turning Mill

Cincinnati Hypro Planer Type Milling Machine

G. & L. Vertical Plastics Injection Press

DAVIS

Complete Tooling Service

Could a wheel do it better?

A widely accepted method of finishing many parts and tools is by application of an abrasive belt of certain specifications. Yet, it is entirely possible that an improved method may some day be devised—the use of a special-type abrasive wheel, for instance...on a new type of polishing wheel.

Should this ever occur, CARBORUNDUM would undoubtedly be among the first to produce the right wheel. But, *even more important*, we would be fully prepared to explain the pros and cons of both methods. Because only CARBORUNDUM makes a *complete* line of abrasives...we can recommend *impartially* the right abrasive for every application based on our experience with all abrasive products.

Perhaps the past few years have brought new developments in abrasives of which you are not aware—developments which could provide increased production, efficiency and economy for you. Your CARBORUNDUM representative will gladly give you impartial technical advice on proper application to your processing.

Only CARBORUNDUM
TRADE MARK

makes ALL abrasives to give you the proper ONE

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, N.Y.

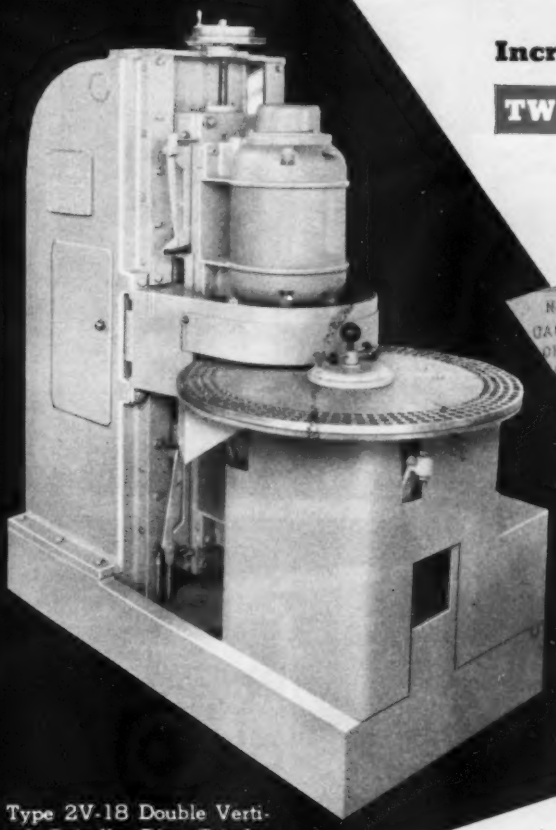
NEW LOW COST

GARDNER

precision disc Grinders

Increase production by grinding

TWO surfaces in ONE operation



Type 2V-18 Double Vertical Spindle Disc Grinder

Horizontal work carrier permits quick, easy loading of small coil springs

For lower production costs investigate

the Gardner TWO in ONE method

WRITE FOR CATALOG!

GARDNER MACHINE COMPANY

410 East Gardner Street • Beloit, Wisconsin, U.S.A.

NORTON
ABRASIVES
Abrasives - Grinding Wheels - Grinding and Lapping Machines - Refractories - Porous Mediums - Non-slip Floors - Boron Carbide Products - Labeling Machines

You'll Get Better Performance Out of These *5 Feature* Norton Mounted Wheels and Points

WHETHER you use mounted wheels and points by the dozen or by the thousands, you'll like the improved performance that you'll get from these Norton products. They are made by a *new process* in the *new* Norton grinding wheel plant.

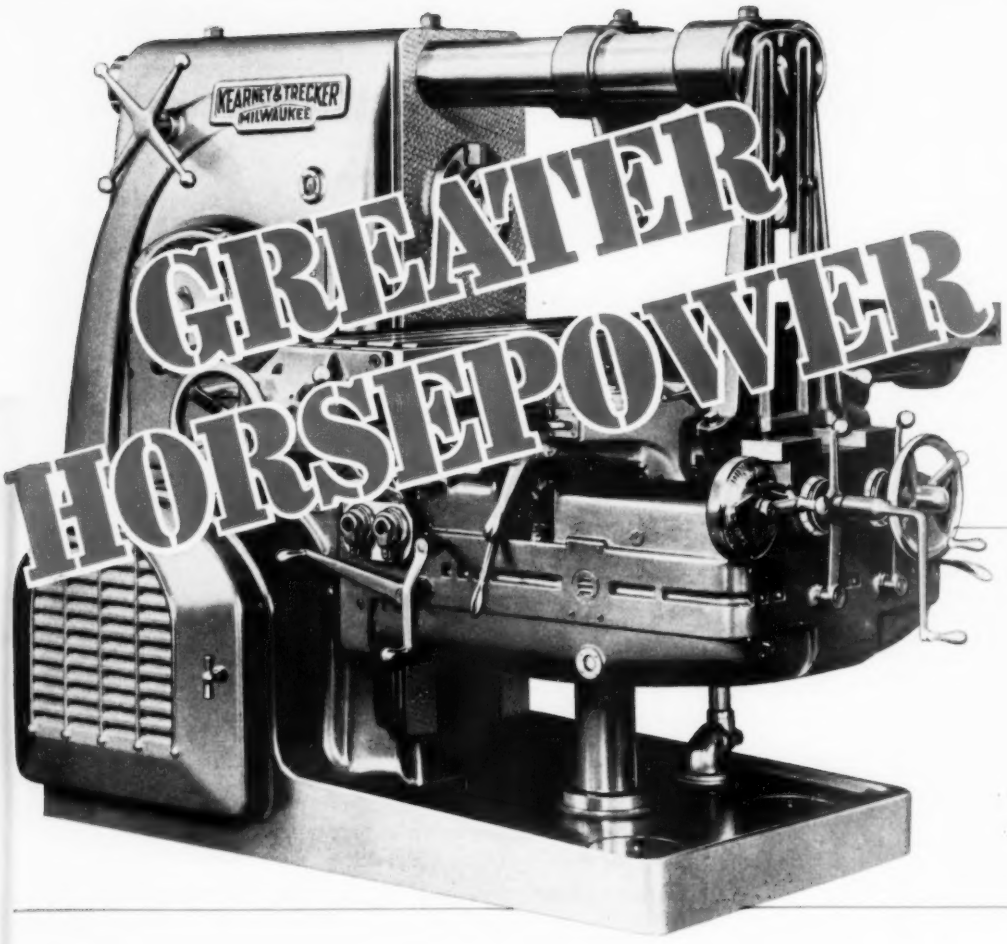
1. **They Cut Fast**—Norton mounted wheels go right to work cutting—and fast—because they receive a truing operation which removes the "mold skin" and leaves the wheel bristling with sharp points.
2. **They Hug the Work**—Norton wheels are absolutely concentric because they are trued on their own spindles. They run true and smooth with no tendency to bounce on the work.
3. **They are Vibrationless**—Perfect balance is especially important in these small wheels which run at terrific speeds. Inherent balance is built into Norton wheels by the new Norton manufacturing process.
4. **They have Long Life**—All grains in the wheel share equally in the job of cutting. None are wasted by vibration and pounding. None have to be trued away to obtain concentricity.
5. **They are Uniform**—Improved mixing methods, precision molding and electric firing produce wheels even more alike than the peas in a pod. You get the same performance from *every* wheel.

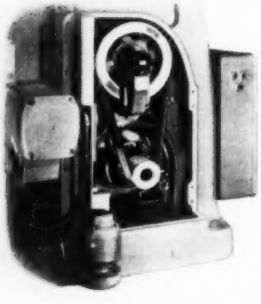
Whether you are using mounted points and wheels for the fine finishing of delicate dies and molds or for real stock removal on intricate castings, you'll like the improved performance that you'll get with Norton. Write for catalog—ask for Form 43-A2.

Making better products to make other products better

NORTON ABRASIVES

NORTON COMPANY, WORCESTER 6, MASS. • Warehouses in Five Cities • Distributors in All Principal Cities

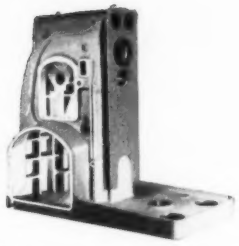




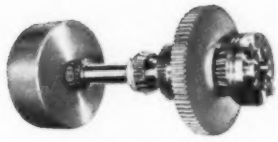
KEARNEY & TRECKER MILWAUKEE **CK's**

With the broader use of carbide and cast alloy tools for milling ferrous and non-ferrous materials, progressive shop men have demanded *greater horsepower* to take full-est advantage of these tools. Kearney & Trecker's new CK milling machines meet this demand. Depending on machine size, (No. 2, 3, 4, 5, or 6) you get 10 to 25 hp independent motor spindle drive plus separate 3 to 5 hp feed and rapid traverse drive. Spindle and feed motors are interlocked with positive automatic safety control for overload conditions. No danger of stalling cutters in cut. Added to *greater horsepower* are the many other pace-setting CK features — that give you the most productive, profitable milling machines you can buy today — anywhere!

Replacement of obsolete machine tools is an



GREATER RIGIDITY — Yes, these new CK columns are the most rigid milling machine columns we've ever designed! They give you 1000 pounds more metal scientifically distributed in heavier ribbing, box section, sponson construction . . . to effectively absorb vibration from heaviest cutting loads.

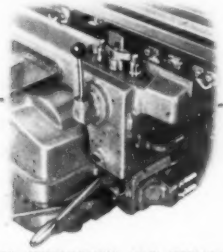


GREATER CUTTING EFFICIENCY — Added momentum of spindle-mounted flywheel assures longer cutter life and greater efficiency, through smoother, more positive drive — a key to most efficient use of modern cutting tools. Spindle rigidly supported by Kearney & Trecker's original 3-bearing design.

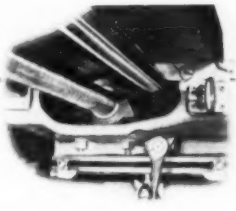
GREATER ADAPTABILITY — No. 60 Heavy Duty drive flange on Nos. 4, 5 and 6 machines enables use of heavy duty arbors with flange drive for large single or multiple cutter setups; or bolting large face-milling cutters directly to spindle nose. Average setups use standard arbors with No. 50 spindle drive.

NON-GLARE RAPID-SET DIALS—You'll avoid costly errors in reading and setting these new micrometer dials. They're vapor blasted to give you a satin surface with high contrast markings. They're easy and quick to set and provide positive lock at every setting.

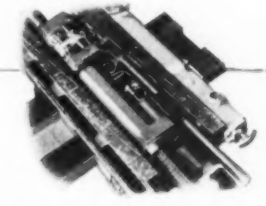
FEEDS AND SPEEDS TO TAKE FULL ADVANTAGE OF MODERN CUTTING TOOLS — and you really can do it with the broad feed and speed ranges on Kearney & Trecker's new CK milling machines. You get 24 spindle speeds (15 to 1500 rpm on Nos. 2 and 3, 13 to 1300 rpm on Nos. 4, 5 and 6) with Kearney & Trecker's automatic protecto-mesh shift to eliminate gear clashing. And there's the extra-wide feed range — 32 changes from $\frac{1}{8}$" to 90" per minute—with separate 3 or 5 hp feed and rapid traverse drive.



GREATER PRODUCTION AND GREATER OPERATING CONVENIENCE—Production men will like Mono-Lever Control because it reduces idle cutter time, shortens floor-to-floor cycle time on both long and short run lots. Operators will like it because it makes faster, simpler, less fatiguing work for them.



SMOOTHER FEED PERFORMANCE — with a new design 2" diam. heavy-duty, table feed screw that affords greater bearing contact and runs through an extra-long table feed nut. These new CK machines are equipped with a backlash eliminator for more effective climb milling, more accuracy and longer screw life.



GREATER MACHINE LIFE — through automatic lubrication and generously proportioned gears and shafts throughout for overload conditions. There's a forced flood system in the column and knee, and a positive metered, pressure pump system for table, saddle and knee ways, and table feed assembly.

Kearney & Trecker's new CK Line is designed to meet every demand of present-day milling operations . . . making CK machines more accurate, and MORE PRODUCTIVE for you. Contact your nearest Kearney & Trecker representative or write direct to obtain complete specifications of these fine new machines. See how they easily replace obsolete machines at substantial savings to you. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

investment that makes Dollars and Sense.

Alloy Steel Products Co., Linden, N. J. finds the answer in Warner & Swasey Automatics

● Alloy Steel Products makes stainless steel valves for the chemical and oil industries. Production, limited to short runs, had been done profitably on turret lathes . . .

But now with *more* volume needed,

How to have plant expansion without building construction

there wasn't room for more lathes, and construction costs for plant expansion was prohibitive. Subcontracting was tried, but these threatened to throw selling prices out of line.

The new CAMLESS Warner & Swasey 5-Spindle Automatic provided a solution. On these machines short and medium runs are practical, and Alloy Steel Products Company handles 69 different jobs in lots of 200 to 500, *profitably* on this new type automatic.

No investment in cam stocks—no setup man was needed!

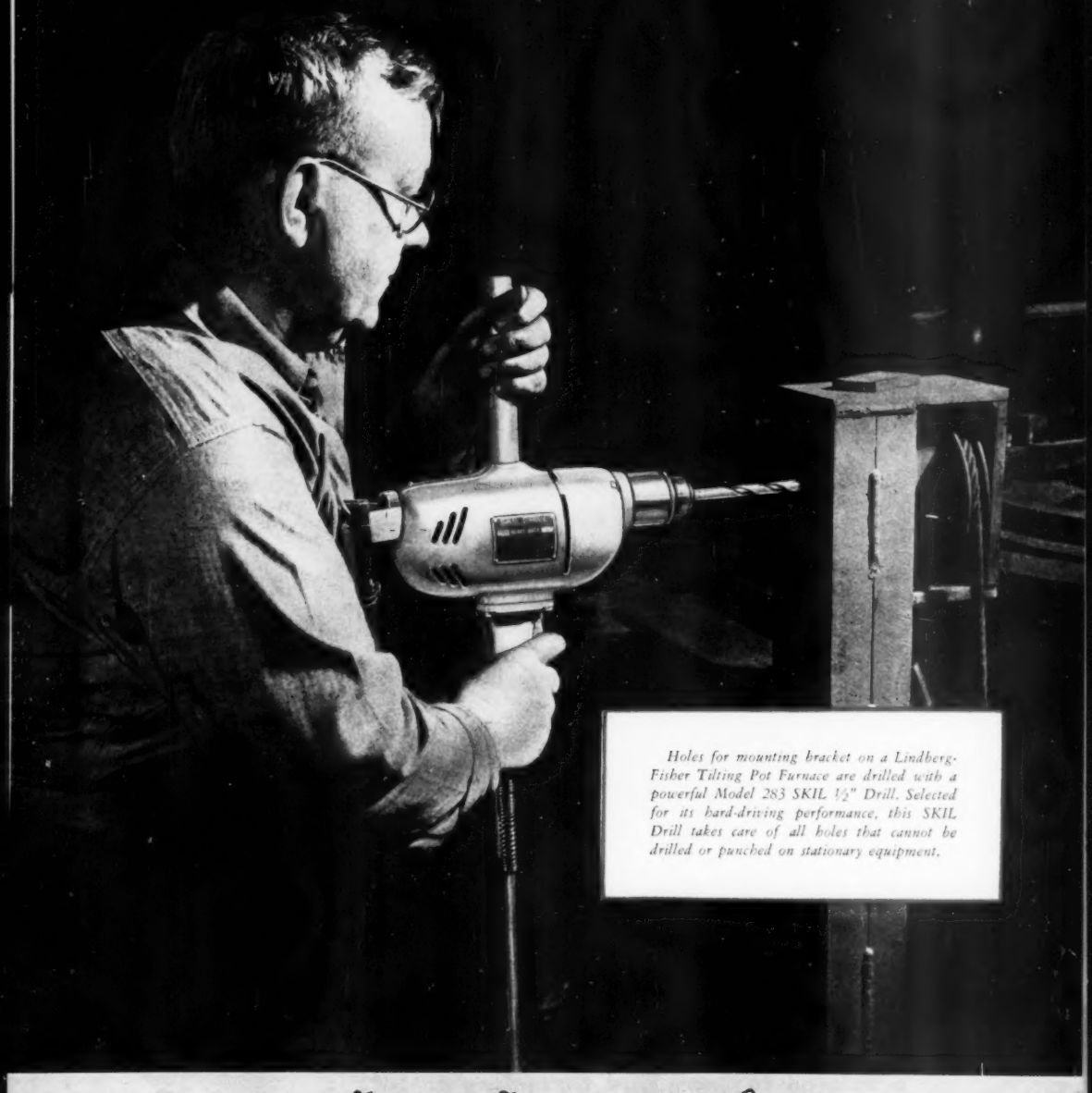
Volume—better in quality and finish—stepped up to an all-over average increase of 50% without need for additional floor space.

"IT'S SIMPLER TO SET UP A WARNER & SWASEY CAMLESS AUTOMATIC!"

turret lathes
multiple & single spindle automatics
precision tapping and threading machines

WARNER
&
SWASEY
Machine Tools
Cleveland

SKIL Drills speed generator



Holes for mounting bracket on a Lindberg-Fisher Tilting Pot Furnace are drilled with a powerful Model 283 SKIL ½" Drill. Selected for its hard-driving performance, this SKIL Drill takes care of all holes that cannot be drilled or punched on stationary equipment.

SKIL Saws **SKIL Sanders** **SKIL Grinders** **SKIL Sanders** **SKIL Drills** **SKIL Shear** **SKIL Grinders**

assembly at Lindberg Engineering Company

SKIL 1/4" and 1/2" Drills cut costs, save time on production lines...

Walk through the large Lindberg shops. You'll find real production efficiency . . . *and you'll find fast-working SKIL Drills* . . . in every department. See how easily they handle on every job and on every operation where electric drills are used. Like other leading manufacturers everywhere, Lindberg has relied on SKIL equipment for years.

Prove SKIL performance the sure way—try them in your plant on your tough production or maintenance jobs! Ask your SKIL Tool Distributor to demonstrate SKIL Drills, Grinders, Sanders, Saws and other SKIL Tools today.

Holes for mounting water jacket covers on Lindberg HYEN Atmosphere Generators are drilled with a Model 45 SKIL 1/4" Drill. Model 45 is a favorite with men and women workers for its compact, lightweight construction; easy grip; effortless handling and its fast drilling in tight spots.

Model 825 SKIL Saw is used in the shipping department to saw lumber for a large export crate. Lindberg says, "SKIL Saws are used for work of this type to eliminate walking back and forth to the stationary saws, resulting in a great saving of time."

SKIL Products are made only by
SKILSAW, INC.
5033 Elston Ave., Chicago 30, Ill.
Factory Branches in Principal Cities
In Canada: SKILTOOLS, LTD.,
66 Portland St., Toronto, Ont.

SKIL Grinders

SKIL Hammers

SKIL Drivers

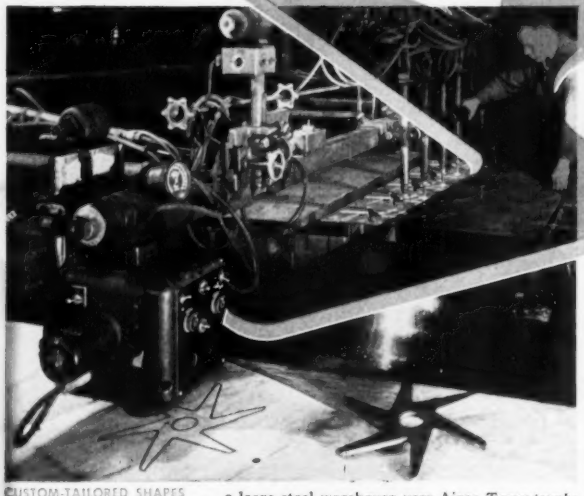
SKIL
PORTABLE TOOLS

precision cutting...unlimited

with

Airco Oxygraph and Travograph

gas cutting machines



CUSTOM-TAILORED SHAPES . . . a large steel warehouse uses Airco *Travographs*, equipped with Electronic Tracing Devices to produce an almost endless variety of steel shapes . . . custom-cut singly or in quantities with full precision and accuracy—providing them a time-, trouble- and money-saving customer-service.

Fast, modern multiple-torch gas cutting with an Airco *Oxygraph* or *Travograph* machine has brought "precision" within the scope of all flame cutting operations. Plates, slabs, billets and forgings are accurately shaped; squared or beveled—in any quantity, faster . . . at less cost than with any other known method.

Accuracy in continued service has won both these rugged, gas cutting machines wide acceptance as production tools. From the basic design, maximum resistance to torsion and deflection are built into each machine—guaranteeing faithful reproduction.

The *Oxygraph* is a stationary machine, designed for operation with one or more torches for multiple cutting, "stack" cutting, or multiple-torch "stack" cutting. Machine cutting ranges are: largest square 43" side; largest circle 52" dia.; longest straight line 133"; rectangles 3" x 131" to 33" x 40".

The *Travograph* has the same basic design as the *Oxygraph*. However, it is a mobile unit—mounted on a carriage which travels on steel rails. Maximum cutting width is 12'. The cutting length is limited only by the length of the rails, installed in 16' sections.

To afford the greatest flexibility of operation, Airco offers three distinct types of tracing devices—manual, magnetic and electronic. With the electronic device, popularly known as the "Electronic Bloodhound," only an outline drawing or silhouette is needed as a guide. Countless designs . . . from simplest to most intricate—inside and outside *square* corners, obtuse and acute angles, narrow slots, and innumerable other shapes may be cut with extreme accuracy.

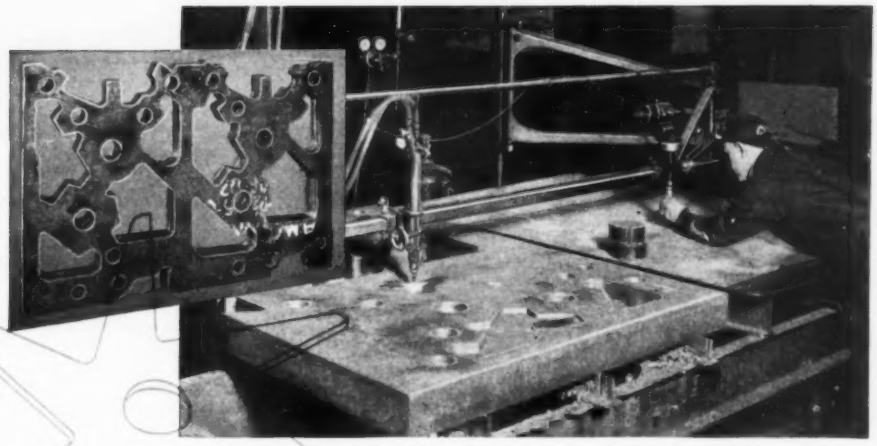
For complete data about these two outstanding Airco gas cutting machines, write your nearest Airco office for Booklet ADC 628C.

AIRCO

AIR REDUCTION

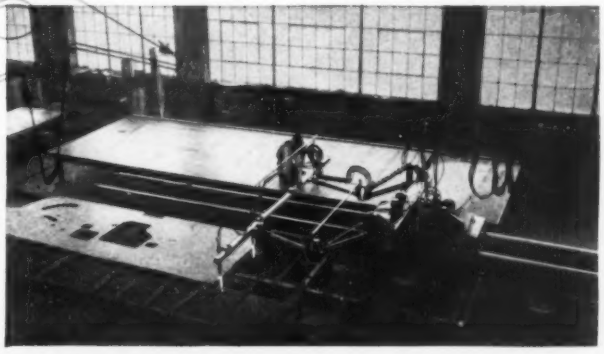
AIR REDUCTION SALES COMPANY • AIR REDUCTION MAGNOLIA COMPANY
AIR REDUCTION PACIFIC COMPANY
REPRESENTED INTERNATIONALLY BY AIRCO COMPANY INTERNATIONAL
Divisions of Air Reduction Company, Incorporated
Offices in Principal Cities

AIR REDUCTION . . . PIONEER



MINIMIZES SCRAP LOSS . . . a nationally known steel fabricator uses an Airco *Oxygraph* for cutting printing press side frames where specified tolerances must be held to an unusually high degree. This permits the most economical utilization of steel with minimum scrap loss, and the machine's extreme accuracy effects considerable savings in machining time and cost; and often makes finish-machining unnecessary.

REDUCES PRODUCTION TIME . . . a huge steel mill speeds metal cutting with an Airco *Travograph*. Plates, slabs and billets are shaped—cut to dimensions, squared and beveled for subsequent fabrication—at an almost unbelievable reduction in production time. Heavy or light sections, regular shapes or intricate contours are all cut with equal facility.



CUTS STEEL WASTE . . . another steel fabricator uses the *Travograph* to cut out sides for large bottle washing machines. They found this machine able to cut these wide sections without moving the work — and because of the accuracy of the cut, steel waste is reduced to a minimum.

DESIGNERS OF FLAME CUTTING MACHINES FOR EVERY PURPOSE

ARMSTRONG
TOOL HOLDERS...
for the toughest steels!

The "Armstrong System" provides special ARMSTRONG TOOL HOLDERS for ARMALOY (cast alloy) and for ARMIDE (carbide-tipped) cutters. With these modern cutting tools, the toughest and hardest steels are easily machined. For heavier feeds and the extremely high cutting speeds become practical (300 f.p.m. with ARMALOY cutters; 600 f.p.m. with ARMIDE cutters). Delays for tool re-grinding are reduced to an absolute minimum—edges hold up to 100 times as long.

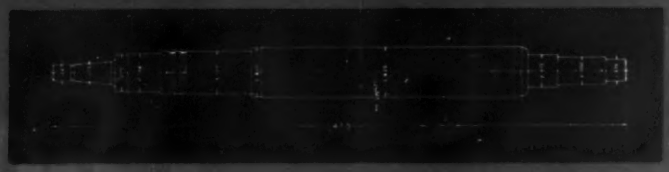
These new tool holders and cutters are stocked by your local ARMSTRONG industrial distributors.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

WRITE FOR CATALOG

5215 West Armstrong Ave. **Chicago 30, U.S.A.**



"AMERICAN"
HYDRAULIC DUPLICATOR

The Latest COST CUTTING Sensation

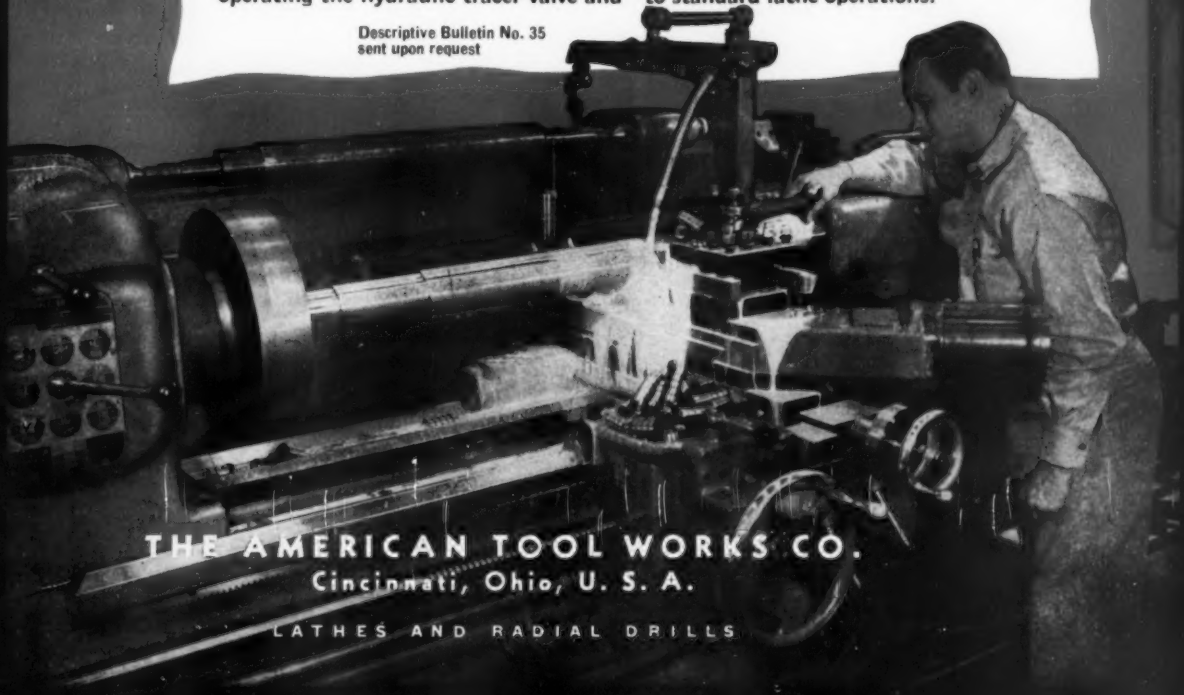
Here's a job that's being done in 34 minutes, floor to floor. This includes a finishing cut to reduce grinding time to a minimum. It formerly took 76 minutes to turn and 50% longer to grind.

This marvelous machine will reproduce steps, tapers, right angle and tapered shoulders, recesses, grinding necks and radii and is especially adapted to the production of such work as spindles, motor shafts, valve stems, back shafts, piston rods and axles. It will also accommodate a wide variety of chuck work having irregular contours.

A single hydraulic system is employed for operating the hydraulic tracer valve and the piston which controls the movement of the tool slide carrying the cutting tool. This simplicity is an outstanding feature and insures accurate reproduction, freedom from failures and elimination of work rejects. This new metal cutting technique permits continuous cutting without interruption for measuring or calipering at feeds and speeds to the cutting limit of Cemented Carbide tools. "Miking" on shaft work is confined to the first diameter only after which all other diameters are secured automatically.

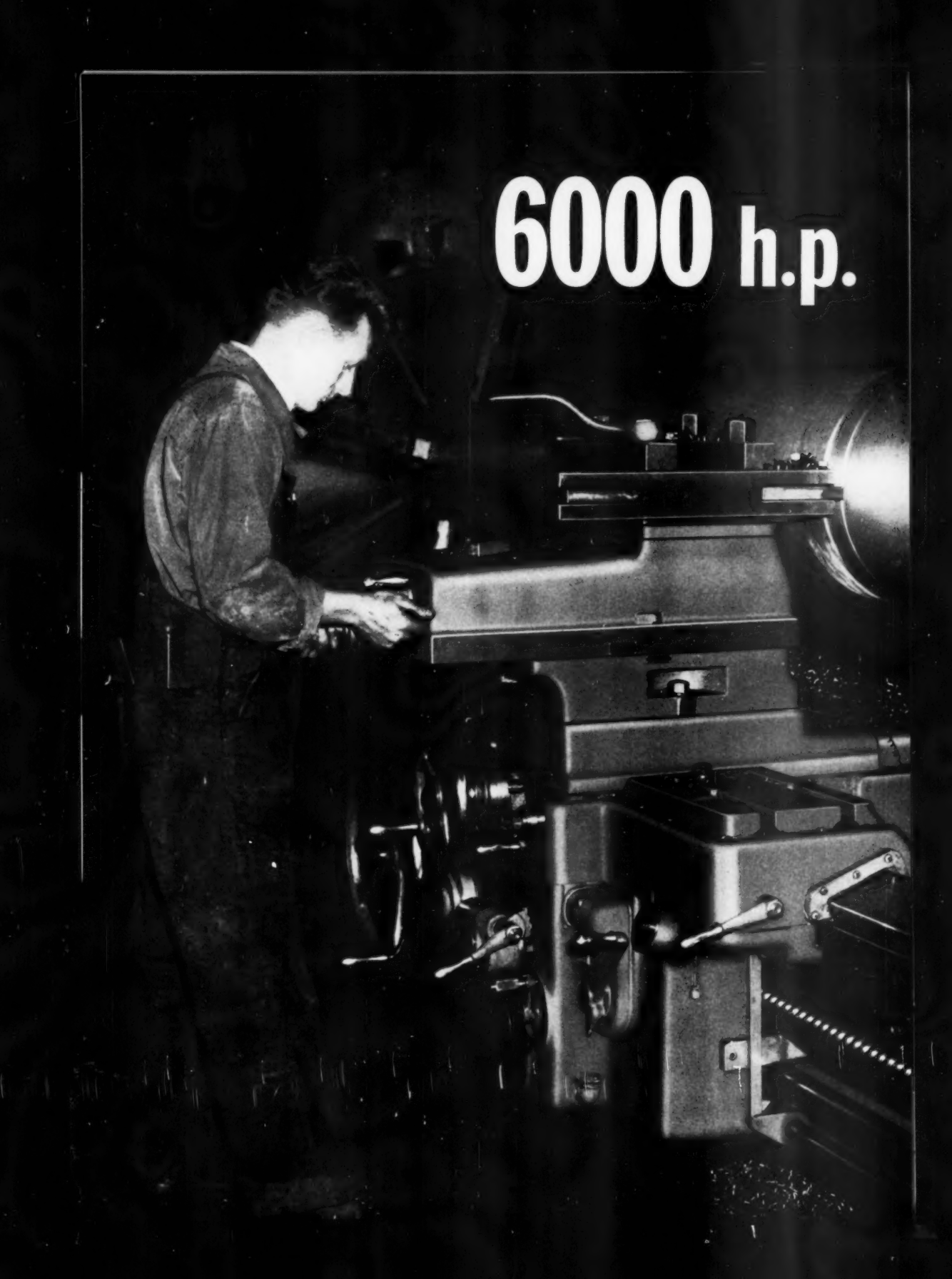
This machine may be quickly converted to standard lathe operations.

Descriptive Bulletin No. 35
sent upon request



THE AMERICAN TOOL WORKS CO.
Cincinnati, Ohio, U. S. A.

LATHES AND RADIAL DRILLS


6000 h.p.

will go through this shaft!

This tailshaft turns the screw in a C-2 Cargo Vessel. It's made to take the relentless pounding of a 6000 h.p. power plant for weeks without letup.

To machine it accurately and economically, Moore Dry Dock Co. of Oakland, California needed a powerful precision lathe. That's why they gave the job to a new LeBlond 50" Heavy Duty Lathe . . . recommended by LeBlond Distributor, Bulotti Machinery Co. of San Francisco. Result? *17 hours off former machining time with a cost saving of 18%.*

This LeBlond Lathe provides fifty horsepower; spindle speeds up to 247 r.p.m.; rigid construction. It makes possible latest turning techniques with carbide tools; gives better finish, closer tolerances and greater economy.

Operators' work is easier, too, because of convenient features—single-lever feed control, exclusive *power rapid traverse* and many more.

Whether you turn ten-ton shafts or ten-ounce bushings, there's a LeBlond Lathe to turn them faster, better. Your nearby LeBlond Distributor will tell you about the 50" Heavy Duty and other late model lathes. Call him or write—

THE R. K. LEBLOND MACHINE TOOL CO., CINCINNATI 8, OHIO

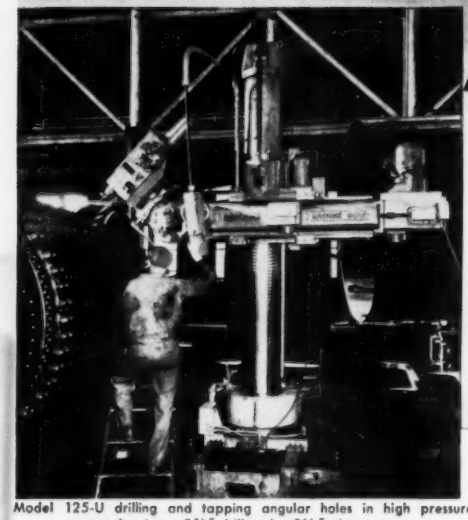
Ask for Bulletin HD-180 A
for more information on the 50" Heavy Duty.

turned faster by

LeBLOND
of Cincinnati

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 63 YEARS*

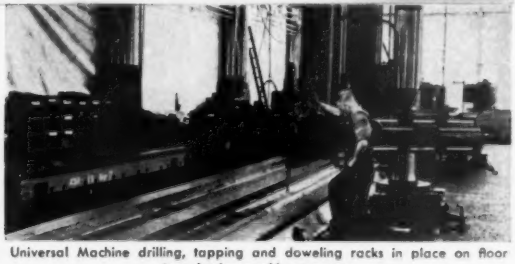
Kaukauna UNIVERSAL AND HORIZONTAL DRILLING and TAPPING Machines



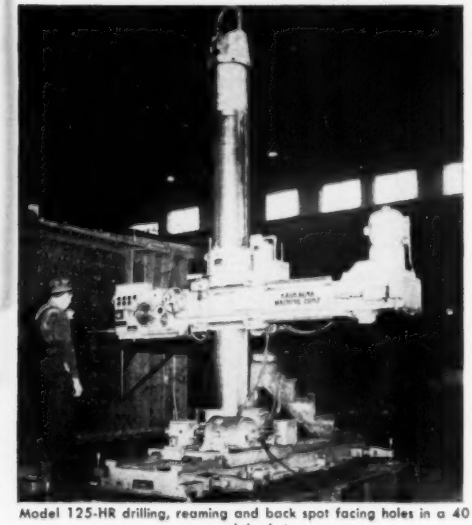
Model 125-U drilling and tapping angular holes in high pressure vessels using a 2¾" drill and a 2½" pipe tap.

PROFIT FROM ANGULAR, VERTICAL AND HORIZONTAL OPERATIONS WITH 1 SETUP

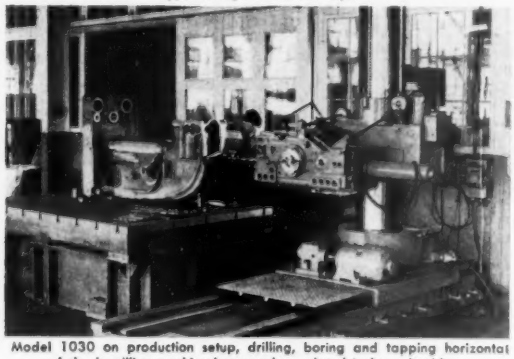
Almost any casting or weldment—of almost any size and shape—can be drilled, tapped or spot-faced in any location accurately, quickly and easily with a KAUKAUNA Machine. Furnished with Universal Head with compound swivels, Tilting Head or Horizontal Head, all with 360° column swivel. Horizontal traverse on runway and vertical traverse on column to suit requirements. For portable or fixed location use.



Universal Machine drilling, tapping and doweling racks in place on floor type boring machine runways.



Model 125-HR drilling, reaming and back spot facing holes in a 40 cu. yd. bucket.



Model 1030 on production setup, drilling, boring and tapping horizontal holes in milling machine bases, columns, headstocks and tables.

Cut your costs on setup time, crane time, fixturing and machine hours. ***Write for Catalog.***

KMC

Kaukauna MACHINE CORPORATION KAUKAUNA, WISCONSIN

General Distributors: Bryant Machinery & Engineering Company
400 WEST MADISON STREET • CHICAGO 6
Exclusive Representatives throughout the World

BRYANT Machinery & Engineering Company
General Office
400 West Madison Street, Chicago 6
Representatives in Principal Cities

"Go" or "Not Go"?

This team of operator and inspector will not have to wait for Final Inspection to know the answer. Process checking at strategic points tells them and their management "how they are doing."

Such inspection warns when tools should be sharpened, machines checked or prior operations re-checked. It also warns when defective product should be discarded before more expense is put into it.

"Indeed a good gaging system soon pays for itself."

BUY GAGES WITH *CONFIDENCE*

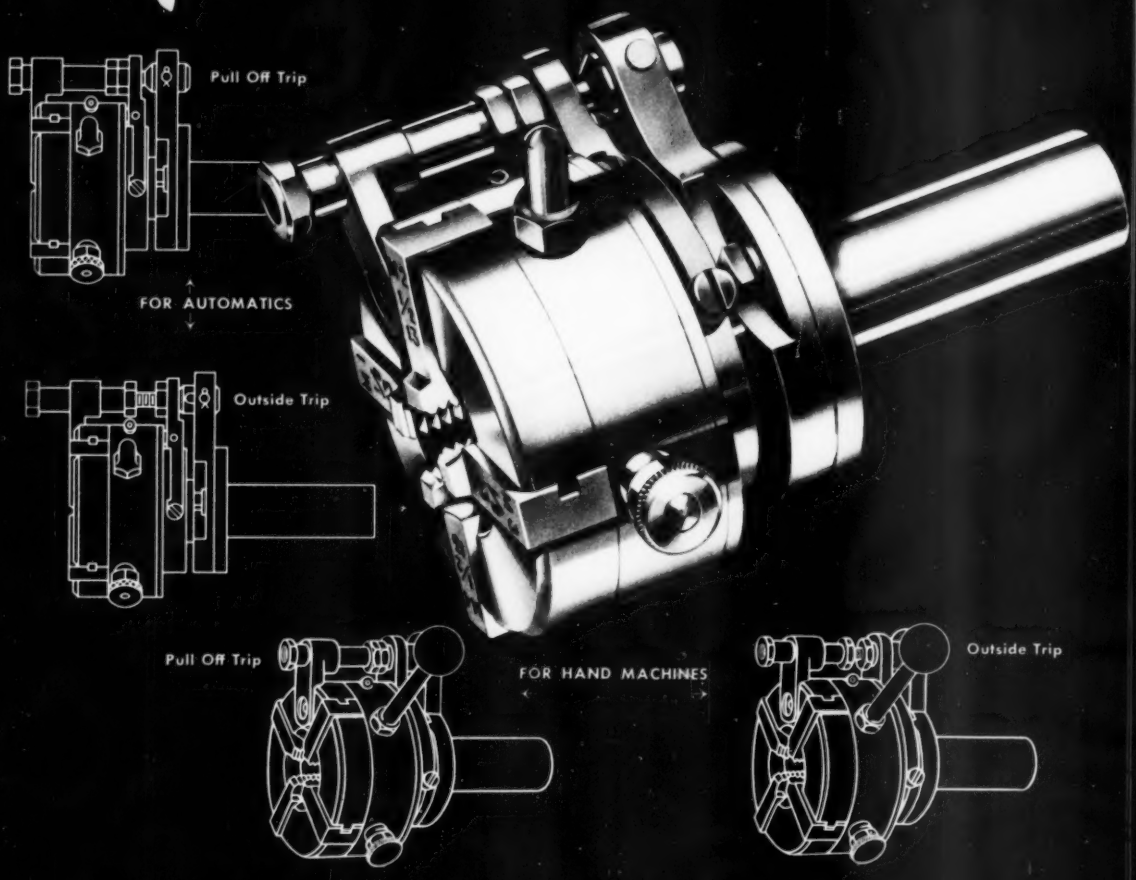
BUY *GREENFIELD* GAGES

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASSACHUSETTS

4 Heads in one

Convertible Die Heads with ALIGNING Shank



No new parts are required to convert the DS Geometric Die Head from Automatic to Hand Trip or from Pull Off to Outside Trip. It's not even necessary to remove the head from the machine!

DS Heads without the aligning feature are also available where alignment is not a problem.

WRITE FOR BULLETIN DS

BE SURE, Buy GEOMETRIC

GEOMETRIC TOOL COMPANY DIVISION

GREENFIELD TAP AND DIE CORPORATION

NEW HAVEN 15, CONNECTICUT

Lubrication fitting with pressure relief feature prevents excessive grease pressure.
Spring-locking collar with set screws clamps bearing firmly on shaft.
Lubricant passes freely into large reservoir to lubricate moving surfaces.
Self-aligning seals effectively keep grease in and dirt out, regardless of alignment.
Wide inner ring distributes bearing load over large shaft area.
Easily installed by slipping bearing onto shaft and clamping inner ring by tightening two set screws in locking collar.
Universally aligning. Capacity for radial thrust loads.
Sturdy, compact cast housing requires minimum support space.
Slotted bolt holes facilitate mounting on supporting structure.
CUTAWAY OF SERIES 200 BALL BEARING PILLOW BLOCK

By any standard . . . **LINK-BELT Bearing Blocks protect and lubricate all moving surfaces**

To give you longer bearing life and extended lubricating schedules, Link-Belt Ball and Roller Bearings are Housing-Sealed —all moving surfaces are completely enclosed and centrally lubricated from a large common reservoir. And only from Link-Belt do you get this important advantage on ball as well as roller bearings. There's a Link-Belt Bearing Specialist near you. Or you can get full engineering information in Data Book 2550.

12,283

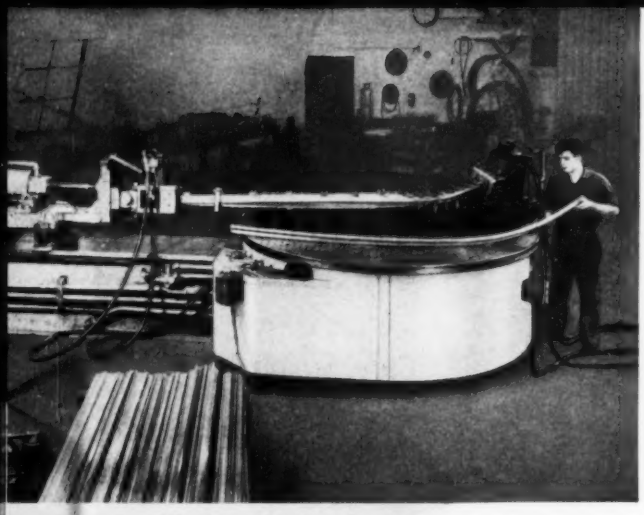
LINK-BELT

Ball and Roller Bearings

LINK-BELT COMPANY: Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in principal cities.

BATH the machine that

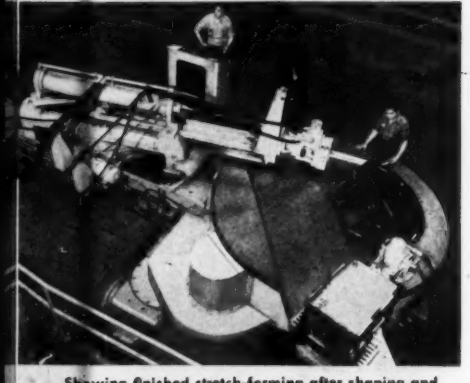
SHEETS, EXTRUSIONS, TUBING,



Above: Stretch-forming and twisting around a compound curve in a multiplicity of planes.

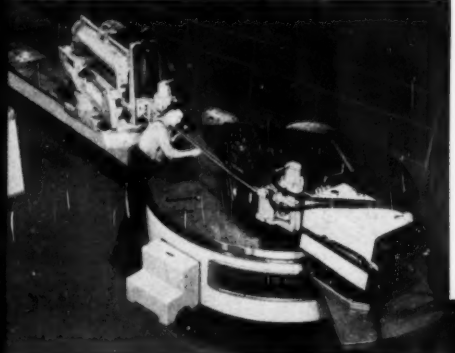
The BATH machine provides the 14 essentials of a UNIVERSAL Contour Former. It is the only machine that can form virtually all the shapes that will be required in future aircraft design.

Hundreds of shapes, with compound curves and varying radii in many planes, are being formed on BATH exclusively because no other machine can produce them. Read the 14 essentials listed below and you will choose BATH—for only BATH provides them all.

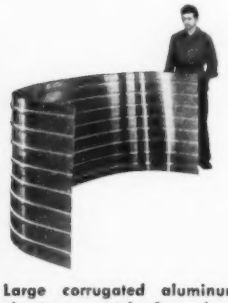


Showing finished stretch-forming after shaping and heat treating at Boeing. Pull in either direction is exerted by both ram and table cylinders.

Aluminum gun turret rings accurately formed to complete circle.

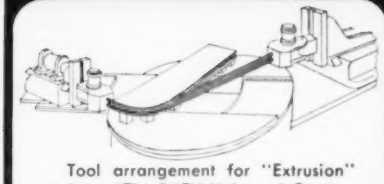


Illustrating the tangent stretching principle on a light section at Boeing. Same machine will handle from 1,000-lb. to 100,000-lb. pull.

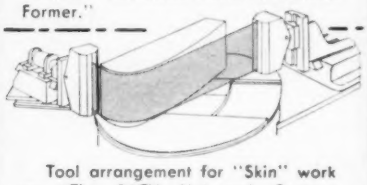


Large corrugated aluminum sheets accurately formed on the BATH machine.

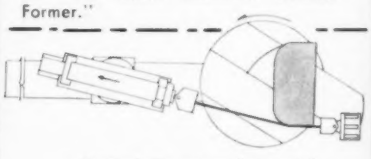
TYPICAL DIE SET-UPS



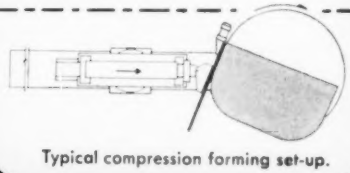
Tool arrangement for "Extrusion" work on "The BATH Universal Contour Former."



Tool arrangement for "Skin" work on "The BATH Universal Contour Former."



Typical die set-up for stretch forming.



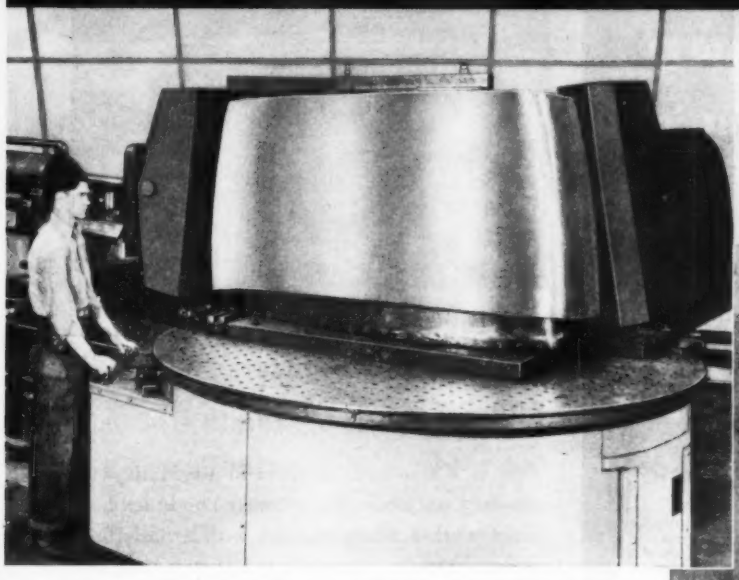
Typical compression forming set-up.

THE CYRIL BATH

6910 MACHINERY AVENUE

forms ALL the shapes

ROLLED AND FORMED SHAPES



Left: Photo illustrates how typical outer-skin section is stretch-formed on the BATH Contour Former. Rotating table construction permits forming sheets with most any combination of curves.

Showing aluminum "Z" extrusion being formed in both horizontal and vertical curves.

Above: Illustrates compress forming of heavy corrugated and flanged section.

Showing progressive stretch-forming of a 20-foot aluminum extrusion.

Showing how full circles and spirals are formed on the BATH machine.

Only BATH Provides ALL These Features

1. **Stretch and compress forming on one machine.** Two-way acting cylinders and reversible table allows choice of forming method best suited to part.
2. **Either sheets or extrusions are formed on the same machine.** Jaw members are movable and adaptable to any cross section.
3. **Tangential, progressive, line by line, forming** on a rotating table permits small capacity machine to do the work of a heavier one.
4. **Heavy sections and parts** that cannot be stretched, may be wipe or roll formed.
5. **Full circles or spirals** are formed in one setting for most any alloy.
6. **Long parts up to 25 feet or more,** can be stretch-formed without re-setting jaws or dies.
7. **Designed to stretch-form reverse bends** without releasing tension on material.
8. **Concentrated application of full tonnage** over small area at a time permits angularity change on extrusions while contours are being formed.
9. **Fast Set-Up:** Die is mounted on table and stretch heads, wiper shoe or roll assembly, can then be easily adjusted to height desired.
10. **Forms or Rolls in Two Planes:** Produces parts with both horizontal and vertical curves simultaneously.
11. **Material can be twisted while being formed** in varying horizontal and vertical planes.
12. **Safety:** Over 10 years of operation have resulted in no known accident to an operator. Machine damage is prevented by shear pins at critical points.
13. **Built to Machine Tool Standards:** Deep sections, eliminating machine deflection, assures constant precise part duplication.
14. **Faster production per hour** with very low scrap loss, rarely running 1%.

COMPANY

• CLEVELAND 3, OHIO

How SUNDSTRAND "Engineered Production" *Plus* Automatic Indexing Increases Production On MILLING JOBS

There are countless cases where the addition of a relatively simple attachment to a milling machine will increase production sufficiently to eliminate the need for purchase of additional machinery. This is often true with the addition of Sundstrand automatic indexing equipment. Milling problem solutions, like the five examples shown here, are the result of Sundstrand "Engineered Production". Call in a Sundstrand engineer on your milling problems. There is no obligation for this service.

❶ Loading While Milling, to Produce 800 Pieces Per Hour

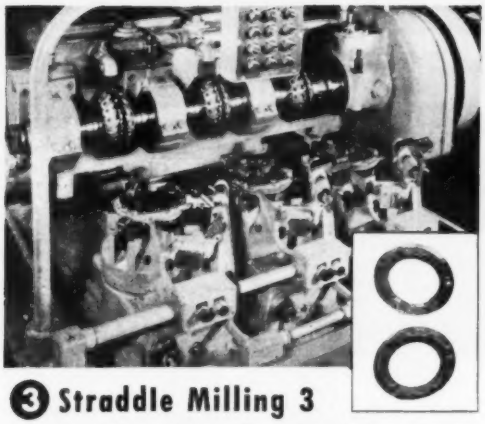
This is a standard Sundstrand Rigidmil with standard automatic index base. The index base has 8 work-holding stations with 2 parts held in each station. Parts are located on pins and clamped and unclamped automatically with the movement of the machine table. As idle machine time for loading is eliminated, production rate of 800 pieces per hour can be obtained.

❷ Milling Multiple Surfaces With One Loading of Part . . . . Production Increased 22.5 Times

Here's a good example of the production possibilities available from an automatic indexing base and a standard machine. Milling time was cut from 3 hours per cylinder sleeve to 7.5 pieces per hour. This increased production is due largely to the use of a standard automatic index base in conjunction with a standard vertical feed attachment. These attachments provide a complete automatic cycle for milling 12 grooves in each cylinder sleeve.

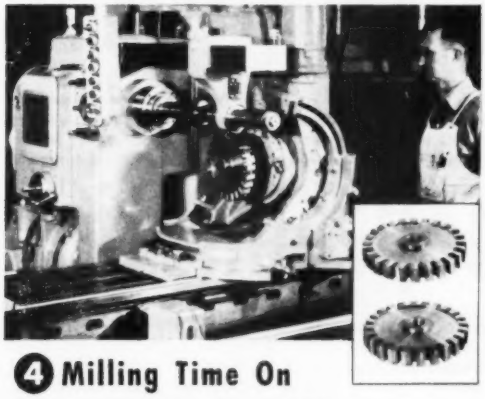
SUNDSTRAND

RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT



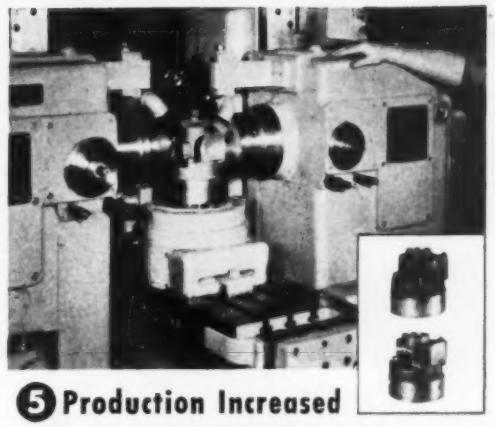
❸ Straddle Milling 3 Clutch Plate Lugs Per Machine Cycle . . . 240 Plates Per Hour

This is a special Sundstrand Rigidmil with 3 automatic index bases. The machine has a traveling head with a single spindle driving 3 sets of cutters on an arbor. The head cycle and indexing fixtures are timed so that each indexing fixture rotates 120° as the head rapid returns from a cut. One part with three lugs, straddle milled and slotted is completed each machine cycle.



❹ Milling Time On Cutter Bodies Cut 46%

This standard Rigidmil has a vertical power attachment for positioning the head and a universal type indexing fixture for milling tooth slots and chip clearance in cutter bodies. Fixture can be set 45° to the right or left of the horizontal center line and up to 10° past the vertical center line or a total of 100° movement. Pieces range from 4" to 14" diameter and lot sizes from one to eleven.



❺ Production Increased From 30 To 67 Pieces Per Hour With Duplex Mill And Automatic Index Base

Four surfaces of the cast iron compressor block shown are milled on a standard Model 22 Sundstrand Rigidmil. This machine is of the duplex type and provided with a Sundstrand standard Automatic Index Base attachment. In using the duplex type machine and providing an automatic indexing cycle, all four sides are machined in two passes of the table and one handling of the part. This results in greater accuracy and eliminates spoilage.

Production of this machine is more than double that of the unit replaced. It produces 67 pieces per hour at 85% efficiency. The old milling setup turned out 30 pieces per hour.

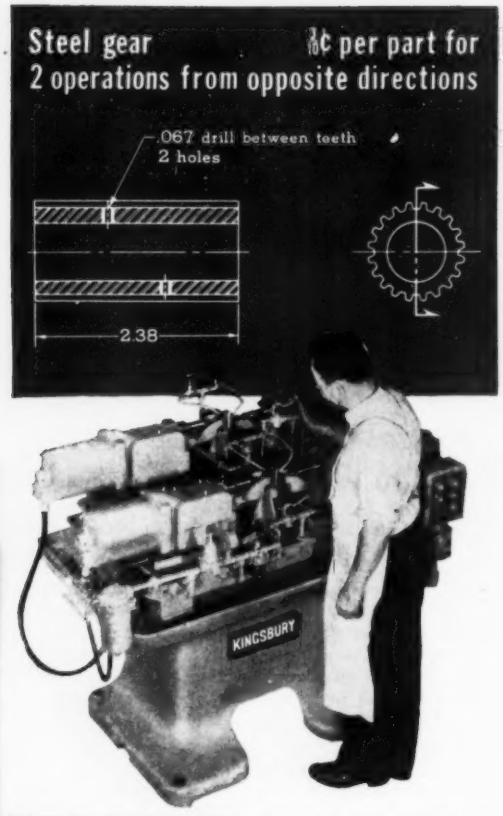
FREE
Additional Data

For more information on Sundstrand "Engineered Production" on milling jobs, write for these booklets. Ask for bulletins 104.

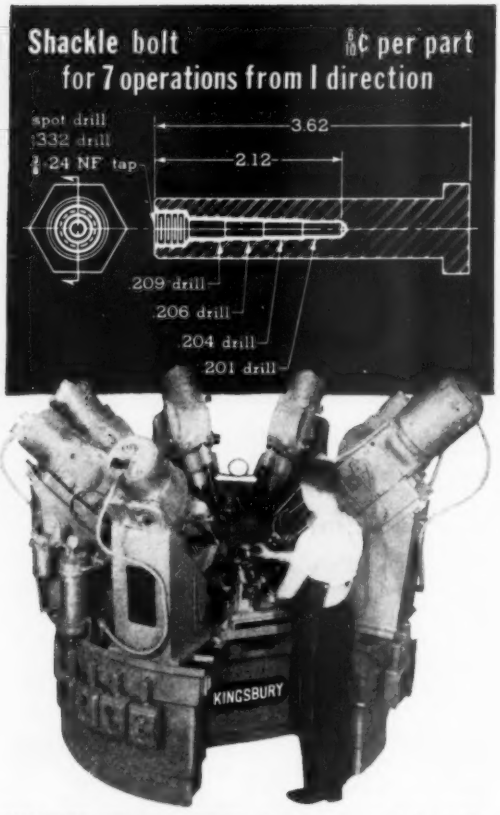
SUNDSTRAND

SUNDSTRAND
Machine Tool Company
2533 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES



900 PARTS AN HOUR GROSS. This setup saves money on a simple job. While the man changes parts in one fixture, two units locate and clamp another part, drill the holes and unclamp. He trips levers to start the cycles. Bushings guide all drills.



1000 PARTS AN HOUR GROSS. A 20-inch power index table has eight double fixtures and seven 2-spindle units that work on two parts at the same time. Angular mounting lets coolant flow inside the hole. Clamping and unclamping are automatic.

These 4 high production

Automatic, single-purpose machines save direct labor, handling, space and rejects on simple and complex work

Dear Sir:

Both jobs above are fairly simple. Those at the right are more complex. Some operations are easy, such as drilling the gear. Other operations are tough, such as milling through an arc on the transmission part.

In every case these machines save money because —

— each machine does the work of several general-purpose machines,

— there is almost no scrap.

One machine replaces several

Automatic drilling, milling and tapping units perform the operations shown in one chucking of the work. At the same time, the man changes the work in another fixture. Each machine here does from 1,440 to 9,520 operations per man-hour (80% efficiency). That means savings in direct labor, handling and space.

Empty scrap boxes

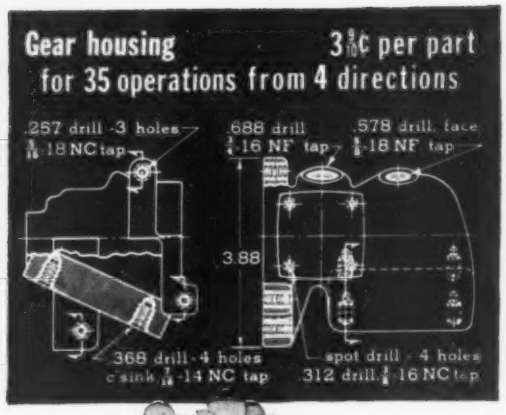
The inspectors won't toss many parts into the scrap boxes.

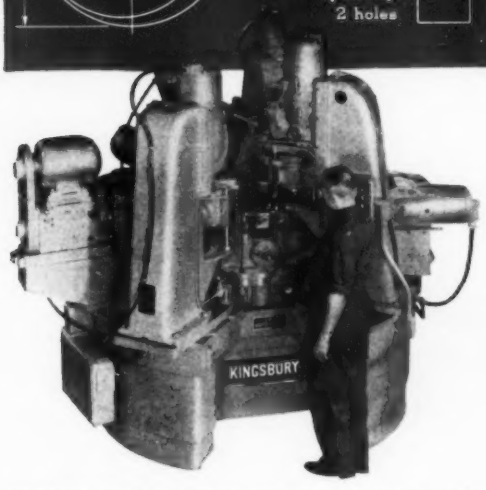
Tools work to close tolerances. We locate spindles to exact indicator readings and use precision bearings. Bushings guide drills and reamers.

Product is uniform. Automatic work cycles never vary. Each part stays in its fixture undisturbed until after all operations.

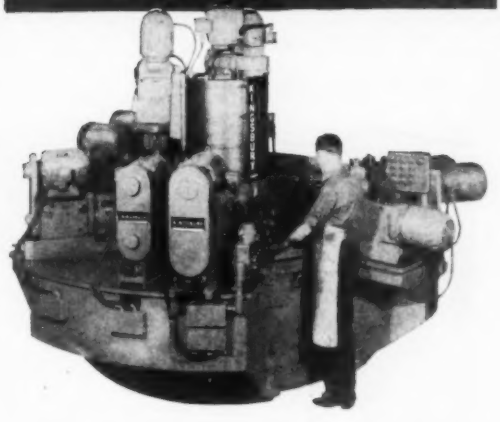
Feeds and speeds are correct. We use single-spindle units to obtain the most efficient feed and speed for each operation. For operations of similar size and depth, units may have multi-spindle auxiliary heads.

Machines will do accurate work for years at intensive production. Wear parts are of heat treated alloy steel. Gears are induction-hardened and shaved. Castings and weldments are normalized before machining. Index tables and fixtures are jig bored to minimum toolroom tolerances.





250 PARTS AN HOUR GROSS. This 26-inch indexing machine has ten units — one 15° above the horizontal, four horizontal, one horizontal off the radial line, two vertical and two 25° off the vertical. One milling unit oscillates through an arc of 21°.



340 PARTS AN HOUR GROSS. A 60-inch power index table has 12 fixtures that rotate 90° during indexing. Two vertical units on the central column do three holes on one face. Nine horizontal units work on three faces. Bushings guide 14 tools.

machines cut unit costs

Was our face red

We might as well admit it here, since *This Week Magazine* has already printed it: For twenty years we paid taxes on a house we never built. Some of our customers kidded us, "Never make mistakes, huh?"

How can you be sure?

How can you be sure we won't make mistakes on *your* machine? Well, it's possible. But as soon as it is set up, we test it with your sample parts. You get the samples to approve. If the parts do not meet your specifications, we work on the machine until you are satisfied. It won't take us long.

How can you be sure a Kingsbury will save you money? First ask our Mr. L. A. Carll for a proposal. Send him a print and tell him the operations and hourly output you need. Then compare that cost with your cost now. Find out for yourself using your own figures.

Sincerely,
Kingsbury Machine Tool Corp.
120 Laurel Street, Keene, N. H.

About the costs on the drawings

Each unit cost includes the man and machine on all operations shown – no power or overhead. We assumed three things: 1) 80% efficiency, 2) Each man's wage rate would equal the national average for such work, 3) The entire cost of each machine and tooling would be paid for after only 6000 hours of operation, a fraction of its useful life.

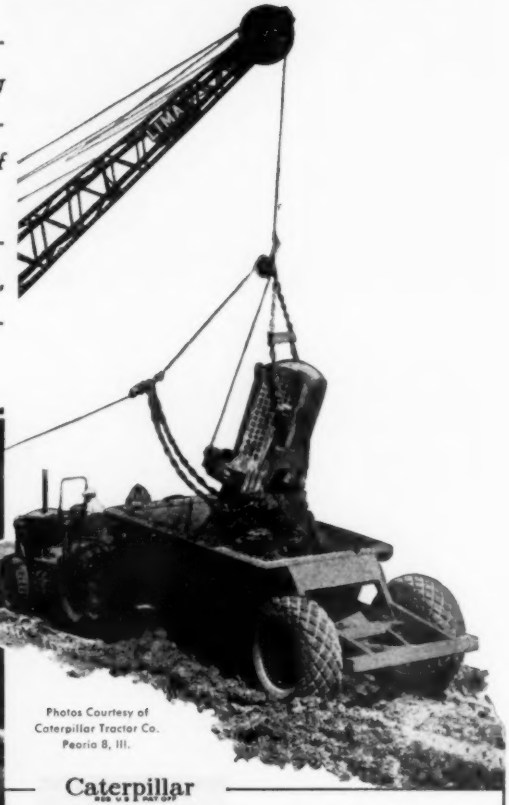
KINGSBURY

AUTOMATIC DRILLING & TAPPING MACHINES
for Low-Cost High Production

Your keenest competitor knows

That no matter how well established his business may be, ***nothing can damage it more than better equipment and better methods in the hands of an aggressive rival!***

He also knows that unless YOUR equipment and methods are "up-to-the-minute", YOU cannot continue to sell YOUR products at competitive prices.



Photos Courtesy of Caterpillar Tractor Co. Peoria 8, Ill.

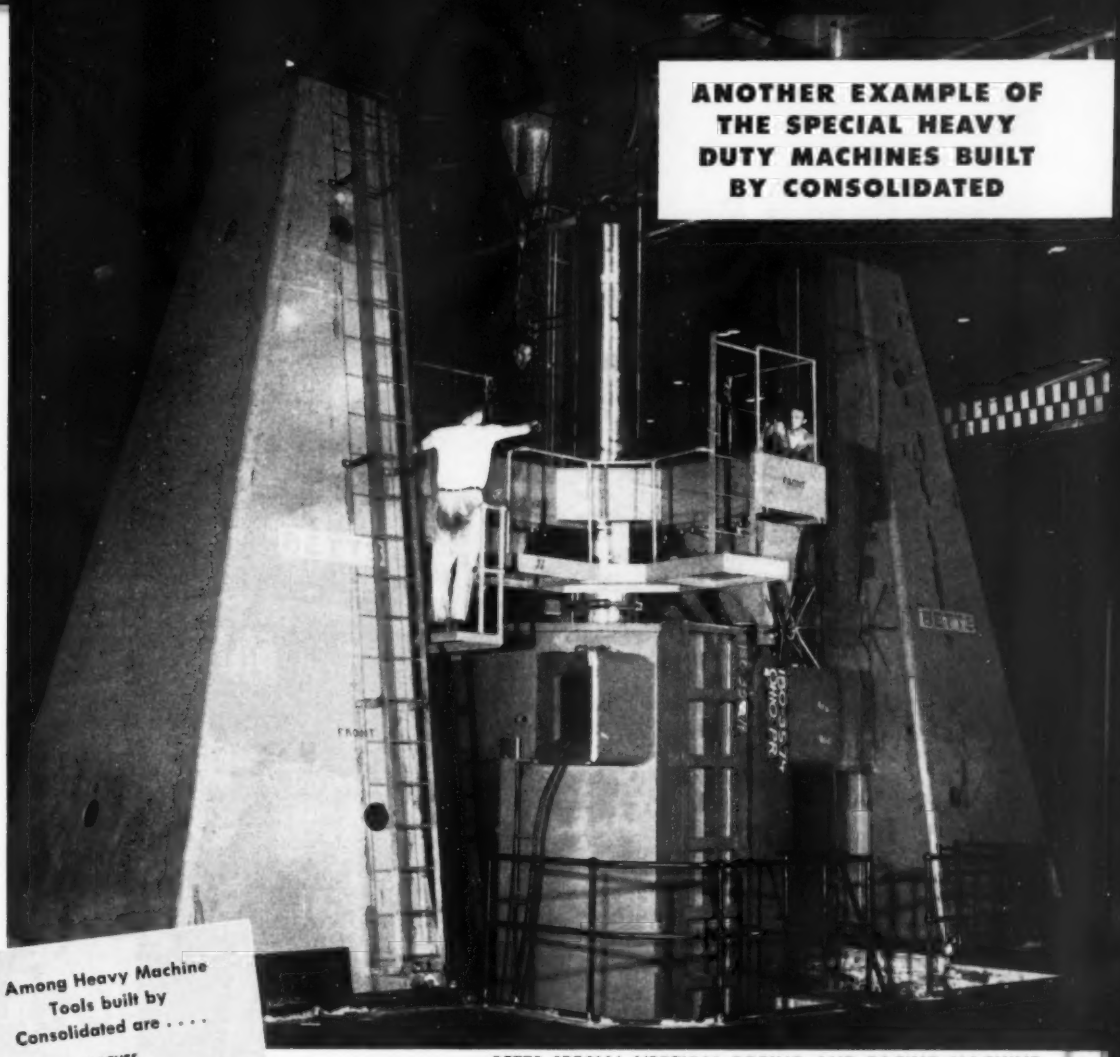
Caterpillar

Here's a big manufacturer, builder of big machines, who knows the competitive advantages of Jones & Lamson Turret Lathes! CATERPILLAR TRACTOR CO. —world famous producer of Diesel Engines, Tractors, Motor Graders and Earth-moving Equipment—makes sure of top-flight production economy by concentrating on up-to-the-minute machines and methods. Meeting production schedules on Caterpillar's turret lathe jobs, like the husky malleable iron Adjustable Bearing shown here, calls for the last word in turning equipment. To bore, turn, face and chamfer such parts, at peak efficiency, takes a fast, heavy-duty turret lathe with reserves of *Speed, Power, Rigidity and Repetitive Accuracy. It takes a J & L!*

Are YOU equipped to YOUR best advantage? Get a free check-up on your present operations. Write today to Jones & Lamson's PRODUCTION RESEARCH DEPARTMENT for this service.

Turret Lathes—Fay Automatic Lathes—Thread Grinders—Optical Comparators—Threading Dies

JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U.S.A.



ANOTHER EXAMPLE OF THE SPECIAL HEAVY DUTY MACHINES BUILT BY CONSOLIDATED

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

BETTS SPECIAL VERTICAL BORING AND FACING MACHINE

Built for one of the larger electrical companies and used for boring and facing heavy welded steel generator stator frames from a vertical position, this unusual machine eliminates the inaccuracies heretofore present in such operation performed horizontally and, at the same time, reduces boring time by approximately two-thirds. It may also be used for drilling rib sections and milling spring assemblies. This machine is 36'-6" high, 13'-0" of which is below the floor level. Weight approximately 190,000 pounds. The boring bar is 22" in diameter and 36'-0" long.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK

When Does a Band Saw Become a Machine Tool?

M.T.

There are basic requirements of accuracy and proficiency that separate a "machine tool" from other power tools . . . characteristics such as those which distinguish a tool maker's screw-cutting, precision lathe from the woodworking lathes used in grade school manual training classes. Among metal-cutting band saws, only the MARVEL No. 8 Series Band Saws can qualify as *machine tools*, for only MARVEL Band Saws have the following capabilities and features:

1 Angular cutting from 0° to 45° right or left *without* moving the work. Built-in protractor.

2 Vertical blade power-fed into material—permits re-entrant cuts, notching, mitering, keyway sawing, etc.

3 Automatic power or manual feeds at the flick of a finger.

4 Feed pressure adjustable even when machine is running. Indicated in actual pounds of pressure.

5 Work clamped to table of machine. Working area more than 835 square inches.

6 Tee-slotted table facilitating clamping down of odd and irregular shaped pieces; easily supports heavy work or large and long structural shapes. Standard vise chucks work on either side of blade.

7 Automatic blade tensioning device. Every blade at uniform tension regardless of operating efficiency.

8 Adjustable upper guide roller holder insuring minimum section of unsupported blade on all sizes of material. Quick acting.

9 Built-in coolant system with delivery at blade entry point. Pump driven without belt or gears.

10 Replaceable vise ratchet and table wear strips of tool steel. New saw performance at all times.

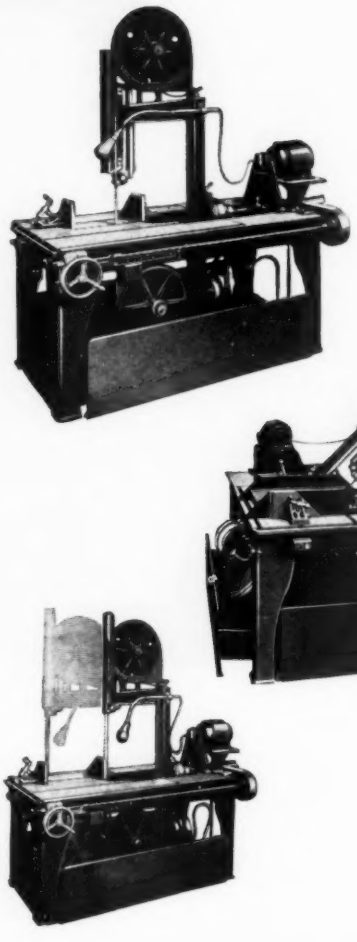
11 LARGE CAPACITY: Standard: 19½" x 18¾". High column: 25½" x 18¾". Handles 99% of all work.

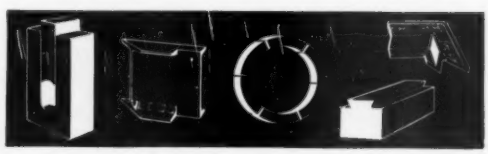
Before buying any metal-cutting band saw, be sure to see the versatile MARVEL No. 8. Your local MARVEL Field Engineer will demonstrate its significant "machine tool" characteristics and their application to your work, with costs, savings, cutting speeds and methods. This technical service is provided, without obligation, in the interests of better metal sawing.

If you prefer to "study it out for yourself," write for the MARVEL C-49 Catalog.

ARMSTRONG-BLUM MFG. CO.
5700 Bloomingdale Ave. Chicago, USA

MARVEL Metal Cutting SAWS
Better Machines—Better Blades





WE INCREASED PRODUCTION 71% WITH J&L "E" STEEL

J&L STEEL

(a story* about how to win customers and influence prospects)

"Got a minute? Well, let me tell you about what happened at our machine shop a couple of months ago when we first tried that new J&L "E" Steel. You wouldn't believe it was possible! (Confidentially, neither did we until we proved it to ourselves.) Here's what happened.

"We got an order to produce a big lot of plunger stops for solenoid starter switches. They're tricky to run, and you've got to be pretty careful every second. We'd read about "E" Steel in some of J&L's ads, and decided we might try some on this job.

"So we ordered some 17/32" E-33 "E" Steel stock, set up our B&S #2 and B&S #0 Automatics and began to turn out parts. We had used B-1113 for this job before and had been getting 350 pieces per hour. But we soon realized we could machine much faster with "E" Steel, and **we kept increasing speed until we were getting an average of 600 parts per hour. That's a 71% production increase!**

"Next thing we discovered was that our tools were lasting twice as long and the chips were coming off better with "E" Steel than they did with B-1113. We also found that the finish on the parts had improved from 20% to 25%.

"That's why we've been using "E" Steel. We turn out work much faster and can take on more jobs. Our men like the way "E" Steel machines and our customers get better parts and better service. Everybody benefits!"

Get your copy of the booklet titled "A Progress Report on 'E' Steel." It outlines a series of 11 case histories from machine shops that have used "E" Steel with excellent results. Write for your copy.

*Based on an actual case history.

Jones & Laughlin Steel Corporation
402 Jones & Laughlin Building
Pittsburgh 30, Penna.

Please send me a free copy of "A Progress Report on 'E' Steel."

Name_____

Title_____

Company_____

Address_____

"E" Steel (U.S. Pat. No. 2,484,231) is easily identified by the distinctive blue color on the end of every bar.

JONES & LAUGHLIN STEEL CORPORATION

From its own raw materials, J&L manufactures a full line of carbon steel products, as well as certain products in OTISCOLOY *and* JALLOY (*hi-tensile steels*).

PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS

"A Machine Designed with **YOU** *in mind"*

The FOSDICK *Sensitive* RADIAL

YOU the production men and operators who use our machines daily.

Yes, Fosdick engineers had YOU the operator and YOU the production man in mind when they designed so many work-saving, time-saving features into the FOSDICK Sensitive RADIAL.

Because of its high utility factor the FOSDICK Sensitive RADIAL fills the gap between the large Radial and the Sensitive and Upright Drills. It has the sturdy construction and flexibility of Radial design plus the high speed characteristics of the Sensitive Drill.

The heavy base construction—the one-piece column and the adjustable swinging table assure perfect rigidity for sensitive drilling and tapping operations. The arm is at fixed height within easy reach of the operator at all times. Both table and arm swing in an arc of 360°.

The functionally designed head has nine speeds and four feeds controlled by means of direct reading levers located at the operator's normal working position.

This work-saving, time-saving machine fits right into the production scheme of both large and small shops. Wherever there is a job requiring holes up to 1½" in diameter there is a definite need for the FOSDICK Sensitive RADIAL.

Consult a Fosdick Representative or Write for Bulletin S.R.A.

FOSDICK MACHINE TOOL CO.
CINCINNATI 23, OHIO

PATTERN FOR PEAK PRODUCTION AT A PROFIT

For Important Reductions in Machining Time...for Accuracy Exceeding Other Production Turning Means...The Monarch Air-Gage Tracer

Look it over! Monarch's 21 years of experience with tracer controls brings you today's Monarch Air-Gage Tracer with every one of these performance features (right). Here is a simple, cost-reducing production method for turning machines. It is recommended for turning multiple diameter shafts and turning, boring or facing contours with a versatility adaptable to a large variety of turning operations. It provides accuracy far exceeding any other lathe duplicating method.

Every Monarch Air-Gage Tracer user knows that these advantages show dollars-and-sense reasons for obsoleting less efficient turning methods—making the change pay off *fast*. You'll know, too, when you examine the complete data in our Bulletin No. 2606. Ask for it—and/or the other Monarch Tracer Control Methods described in the convenient coupon. *The Monarch Machine Tool Co., Sidney, Ohio.*

AIR-GAGE FEATURES

- Imparts a smooth, stepless finish because of the continuous, single tool cut.
- Generally reduces by half the amount of stock left for grinding.
- Often eliminates hand polishing or grinding because of the fine finish imparted to the work.
- Reproduces template form on work more accurately than any other duplicating device.
- Eliminates the need for expensive forming tools and the cost of multiple tool setups.
- Allows a complete setup change in ten to fifteen minutes or less; tool change in one minute or less.
- Permits the machining of practically any combination of diameters, tapers, bevels, forms, grooves, undercuts, shoulders, necks, radii and chamfers in a single continuous cut.

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

FOR A GOOD TURN FASTER...TURN TO MONARCH

THE MONARCH MACHINE TOOL CO.,
Sidney, Ohio

Gentlemen: Please send without obligation the following complete Bulletins:

- ☐ Bulletin No. 2606—The Monarch Air-Gage Tracer
- ☐ Bulletin No. 2302—The Monarch Motor-Traco
- ☐ Bulletin No. 2401—Monarch-Keller Controls

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE ____ STATE _____

"ALL OUR MONEY BACK IN 62 DAYS"

writes KRW Hydraulic Press customer, George Perkins

ANY METAL
ANY TIME
ANY WHERE

MANUFACTURER OF
PERKINS SAFETY SADDLE TANK

GEORGE PERKINS
Electric and Acetylene Welding
1292 FUHRMANN BOULEVARD

K. R. Wilson,
215 Main St.
Buffalo 3, N. Y.

Gentlemen:

I'm not usually a testimonial writer, but I can't help letting you know what a terrific job my new KRW 100 ton, 2 cylinder hydraulic press has done in my shop. My cost records actually show that this press **paid for itself in just 62 days.** And, believe it or not, I sold almost 9,000 tanks in 1950 without a single return or complaint.

Sincerely yours,
George Perkins

Perkins Welding Co., Buffalo, N. Y.

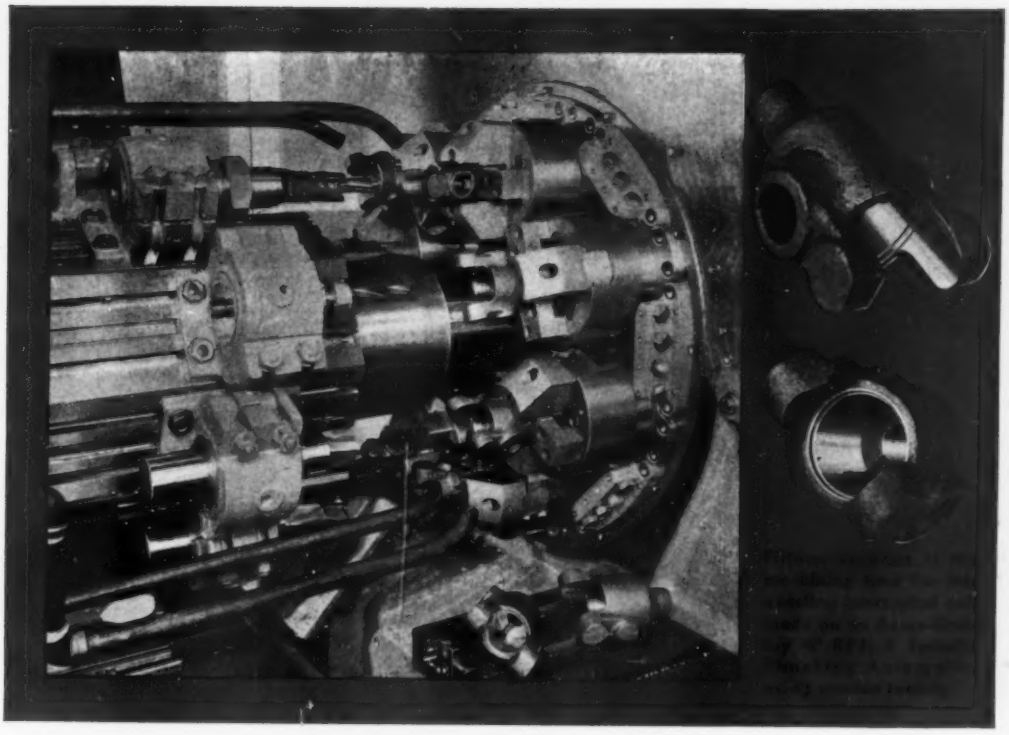
Mr. Perkins makes steel saddle tanks for big trailer trucks. They hold 125 gallons of gas, obviating the need for frequent stops to fill up. KRW engineers showed Mr. Perkins how to save time and cut production costs by forming and bending these tanks with a KRW hydraulic press. They also showed him how to form stiffening ribs on the tanks instead of the welded angle stiffeners he was using. Results? The tanks are now 60% stronger.

KRW Hydraulic Presses can do the same for you on literally hundreds of manufacturing jobs. Available in 25-150 ton capacities, they're entirely above ground. Hand operated, air operated or motor driven. One, two and three cylinder models. First investment is low, operating costs still lower. If you need a specially-built press, our engineering department will "tailor-make" one to your needs.

Ask your machinery dealer to quote you, or write Dept. 11

K·R·WILSON

215 MAIN STREET • BUFFALO 3, N.Y.



HOLD HIGH CONCENTRICITY on high-speed interrupted cuts

...put the job on an Acme-Gridley Automatic

Here's more proof that an Acme-Gridley's basic design advantages pay off in the ability to take it—on the toughest kind of tricky jobs—up to the limitations of modern carbide tooling speeds.

To take interrupted cuts at high speed and still maintain concentricity, an automatic must have rigid, rugged strength in the frame; *an Acme-Gridley's got it.* And direct, positive camming keeps accuracy always up to snuff.

Adaptability is another important advantage of Acme-Gridleys; they'll handle a wide variety of tooling (including independent power-driven auxiliaries where needed). That way, better distribution of cuts or the combining of operations can cut machining and handling times.

All these features add up to give you "more good pieces in the pan," more tough production problems licked. Get the full story on these time-saving, money-saving Acme-Gridley 4, 6 and 8 spindle Chucking Automatics—ask for Bulletin CM 51.

JOB FACTS

PART—Hydraulic Lift Box

MATERIAL—1035 Steel Casting

MACHINE—Acme-Gridley 6" RPA-8 Spindle Chucking Automatic

TOOLING—Carbide

TOLERANCES—.003" on Large Hole; .001" on Small Hole

MACHINING TIME—15 Seconds (240/hr.)

Machine Obsolescence is the Creeping Paralysis That Strangles Profit.

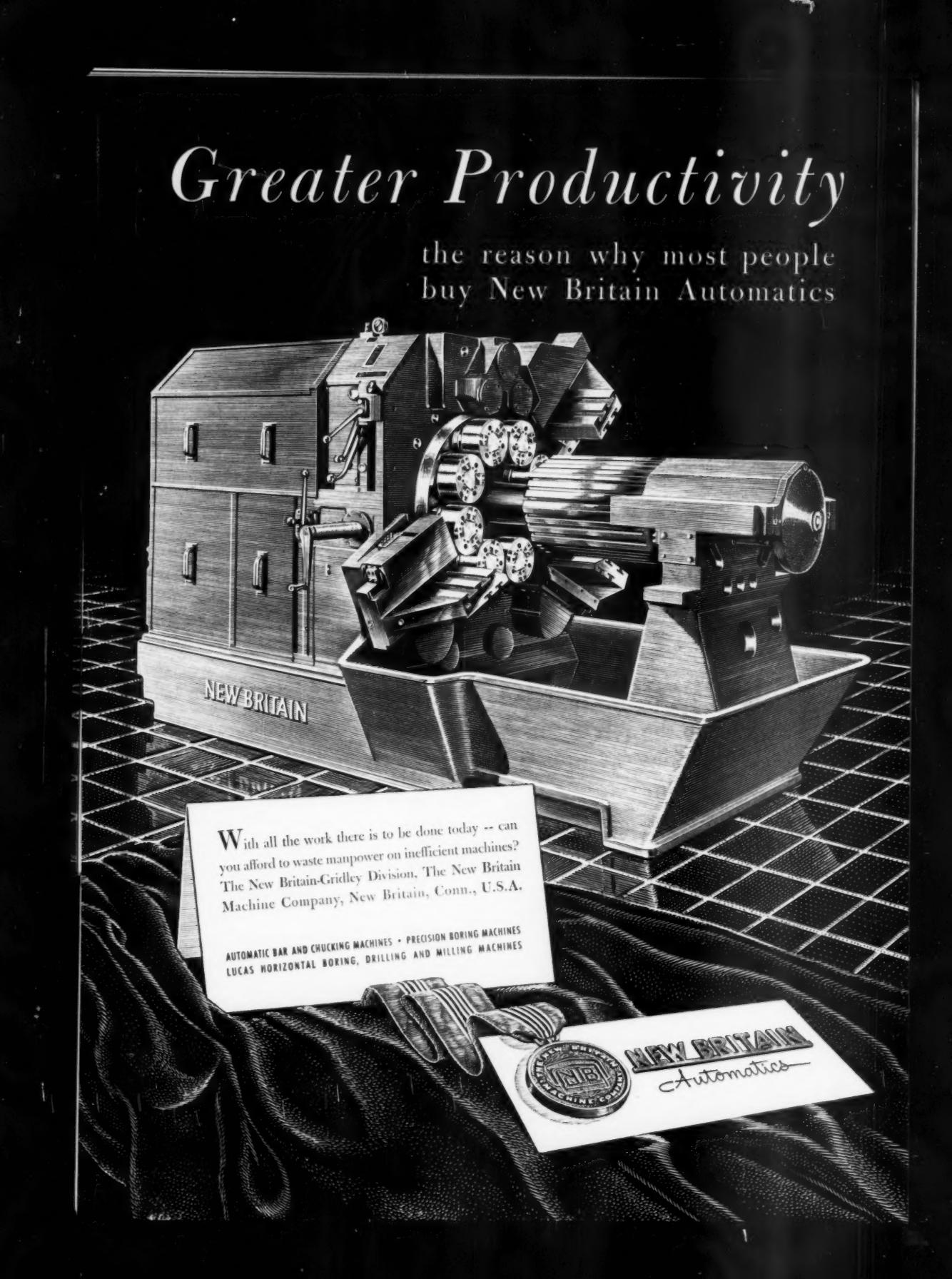
The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronoleg-Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

Greater Productivity

the reason why most people buy New Britain Automatics



With all the work there is to be done today -- can you afford to waste manpower on inefficient machines? The New Britain-Gridley Division, The New Britain Machine Company, New Britain, Conn., U.S.A.

AUTOMATIC BAR AND CHUCKING MACHINES • PRECISION BORING MACHINES
LUCAS HORIZONTAL BORING, DRILLING AND MILLING MACHINES

NEW BRITAIN
Automatics

HOLES
HOLES
and more HOLES
1500 of them

To be sure, this may be an unusual job. However, it proved the flexibility and practicability of the Bullard Spacer.

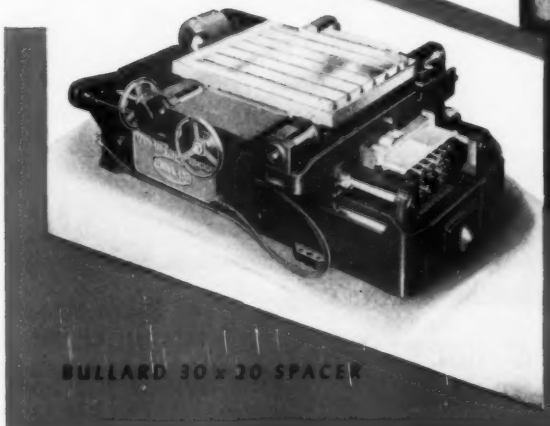
It required several combination of settings between the work location on the table and the drill saddle and arm.

However, the actual set-up and machining time figured 5-½ hours for the Spacer instead of 11-½ by the best previous method.

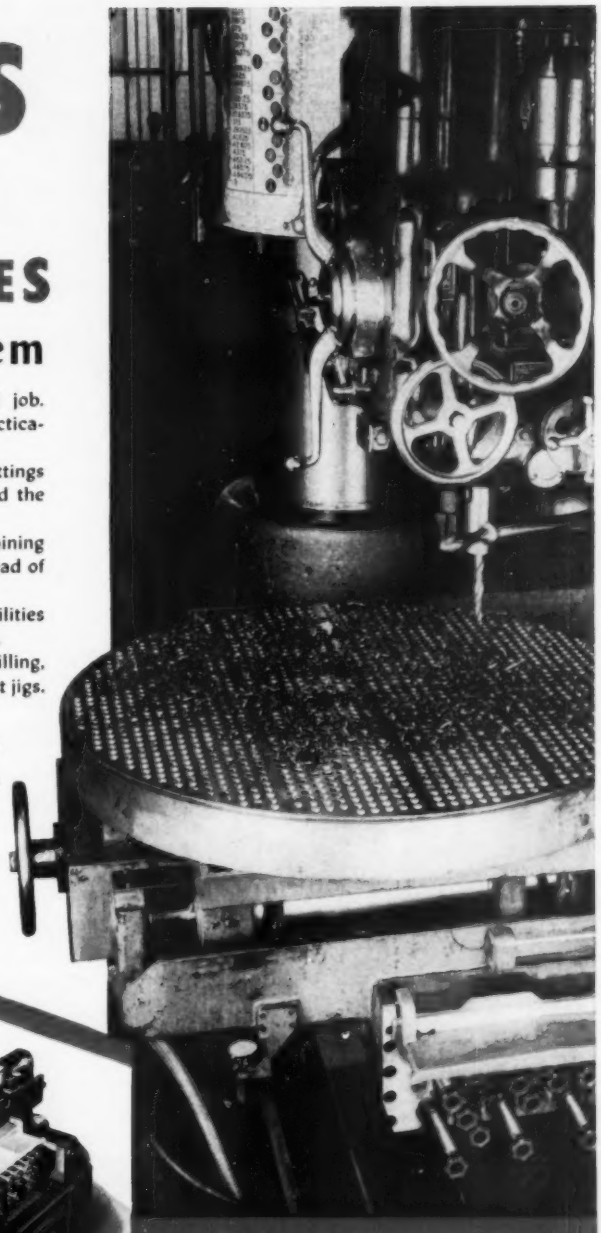
This case study illustrates the possibilities and wide application of the Bullard Spacer.

Here is a machine for spotting, drilling, counterboring, reaming, or tapping—without jigs.

Ask Bullard Engineers how your Jig Costs and problems can be reduced.



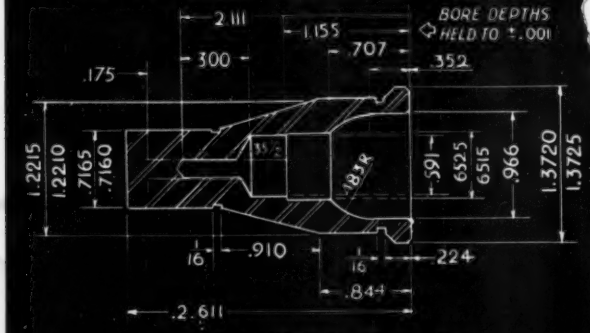
BULLARD 30 x 20 SPACER



THE
BULLARD
COMPANY
BRIDGEPORT 2, CONN.

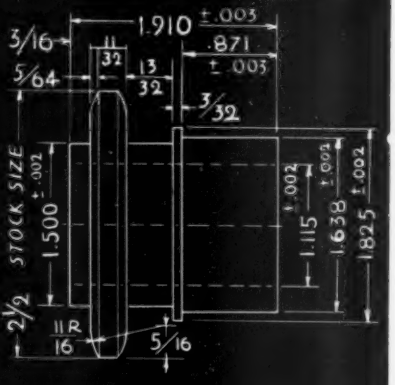
CYLINDER AIR CHAMBER

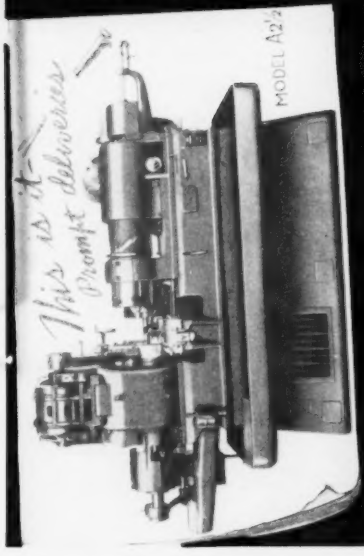
1. Gauge from rear slide Drill ⅛" dia. ½" deep at 352 R.P.M.
2. Drill 3/64" dia. 1.456" deep. Form outside dia. complete and face at 316 R.P.M.
3. Drill 11/64" dia. 2.112" deep at 1502 R.P.M.
4. Counterbore .956" and .642" dias., and Skive outside dia. after counterbore at 316 R.P.M.
5. Finish ream all diameters. Cut off at 352 R.P.M.



TRANSMISSION SPROCKET

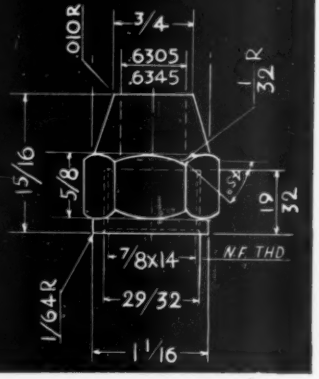
1. Gauge. 2. Spot for drill at 395 R.P.M.
3. Drill 1 3/32" dia. hole. Face end, form 1.638" dia. and 1.825" dia. with front slide. Form 1.500" dias., both faces of tooth form and breakdown for cutoff to 1.500" dia. with rear slide at 231 R.P.M.
4. Ream hole to 1.115" dia. at 395 R.P.M.
5. Cutoff with independent cutoff attachment at 395 R.P.M.





COUPLING

1. Gauge.
2. Drill for tap (use .807 dia. drill with 45° point) at 1010 R.P.M.
3. Drill rest of way through with 3/64 drill at 1010 R.P.M.
4. Tap ⅞—14 pitch thread at 198 R.P.M.
5. C'Bore .630 dia. and chamfer I.D. on front of piece. Cutoff on return stroke at 1010 R.P.M.



Joe, Please NOTE! a Cleveland Automatic ("Model A2½") cuts costs on Jobs like these

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • NEWARK

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

HARDINGE
ELMIRA, N.Y.

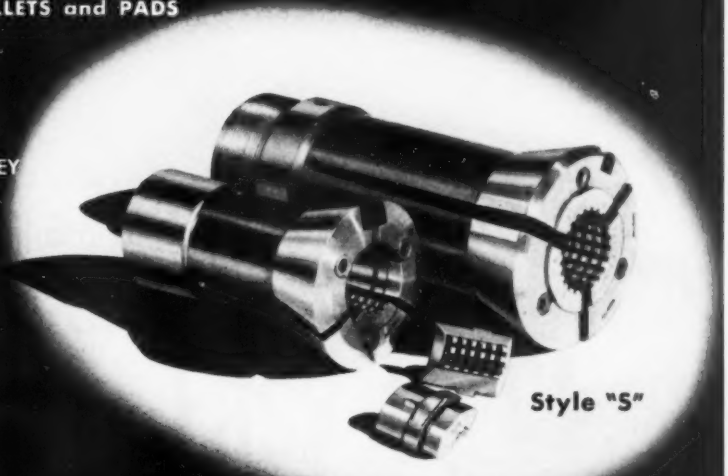
MASTERS AND PADS
for
BETTER PERFORMANCE and BETTER PRODUCTION

HARDINGE STYLE "S" SURE-GRIP DRAW-IN MASTER COLLETS and PADS

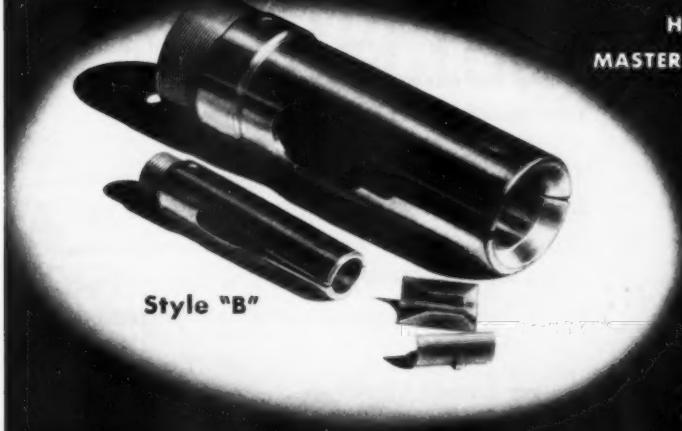
for

CLEVELAND
CONE
GREENLEE
GRIDLEY and ACME-GRIDLEY
NATIONAL ACME
NEW BRITAIN

Available for all sizes of above machines up to and including 3½" capacity.



Style "S"



Style "B"

HARDINGE STYLE "B" MASTER FEED FINGERS and PADS

for

BROWN & SHARPE
CLEVELAND
CONE
DAVENPORT
GREENLEE
GRIDLEY and ACME-GRIDLEY
NATIONAL ACME
NEW BRITAIN

Available for all sizes of above machines up to and including 3½" capacity.

Ask for Style "S" and Style "B" Bulletins which give all performance features, price savings, and ordering information.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

HOW TO OPERATE A PLANT PROFITABLY

Here's what noted manufacturers say...

"55% time saved. Increased production over 100%"....
Automatic Transportation Co.

"30% time saved—our first choice"....
Otis Engineering Corp.

"Turning time cut one-half"....
Link Belt Co.

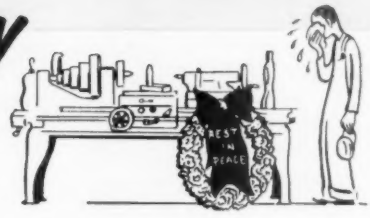
"50% time saved"....
Wyman-Gordon Co.

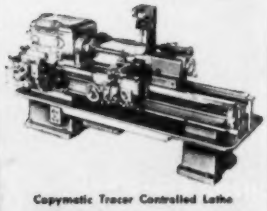
"Superior for lower tooling costs"....
Continental Motors Corp.

"Save 50%"....
Norris Stamping Co.

"The lathe is doing everything and more than we had hoped for".... 400% increase.
American Cast Iron Pipe Co.

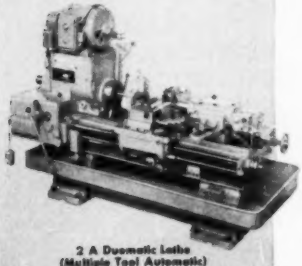
It pays to replace with Lodge & Shipley Lathes!





Copymatic Tracer Controlled Lathe

Model "X" Engine, Tool Maker, Manufacturing, Gap and Oil Country Lathes



2 A Duomatic Lathe (Multiple Tool Automatic)

Lathes only a few years old may be badly outmoded. To compete on a profitable basis your lathes must be truly up to date. The versatility, accuracy and exceptional productive capacity of Lodge and Shipley Lathes are setting records for thousands of alert manufacturers.

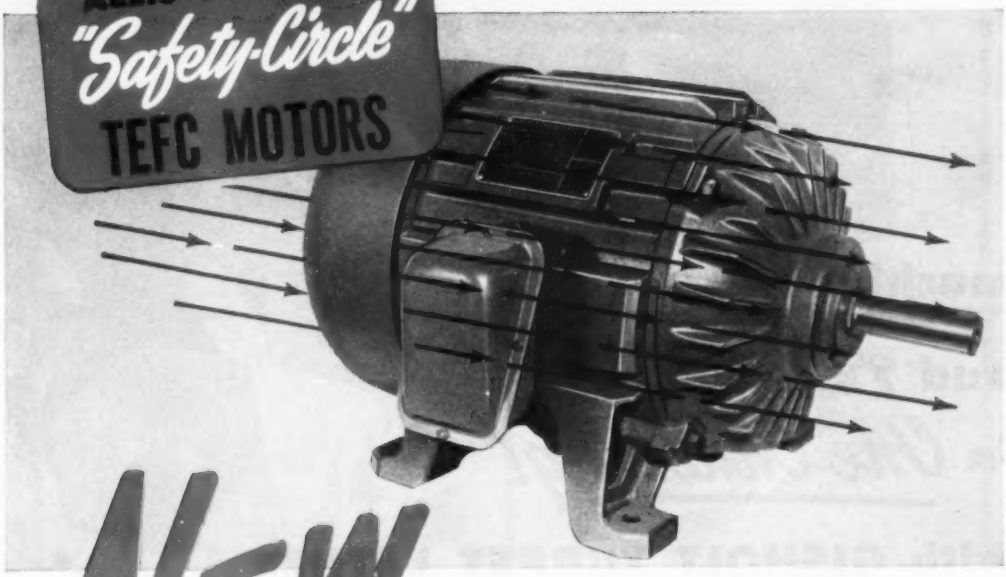
The low cost, precision production of Lodge and Shipley lathes is a valuable weapon in the fight against mounting costs. Replace and modernize with Lodge and Shipley—you will be sure to obtain all the latest advantages for profitable production.

THE Lodge & Shipley COMPANY
MACHINE TOOL DIVISION • 3055 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

ALLIS-CHALMERS

"Safety-Circle"

TEFC MOTORS



NEW Easy to Clean Protected From Dirt

THIS NEW *Safety Circle* totally-enclosed, fan-cooled motor cannot clog with dirt. The ribbed cooling surfaces are outside the motor. There are no pockets or crevices where dirt can collect. Cooling air is not enclosed at any point except the fan cover.

Cleaning is the simplest of maintenance operations done in a few seconds with an air hose. The fan cover also can be removed very quickly for a thorough cleaning.

Factory Lubricated Bearings

Bearings are lubricated at the factory and operate without attention or cost for years. The frame of this *Safety Circle* TEFC motor is cast iron, inherently corrosion resistant, strong and rigid. The extra rigidity of the cast iron frame holds the bearings in true alignment under severe operating conditions. This gives long bearing life and low operating costs.

Get All The Facts

The new *Safety Circle* totally-enclosed fan-cooled motor is built in all NEMA standard frame sizes from 224 to 505. Your Allis-Chalmers Authorized Dealer or Sales Office has complete information. Call today or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B6144. A-3235

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

Safety Circle, Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

machined and *Assembled* in *One Chucking!* with GISHOLT TURRET LATHES

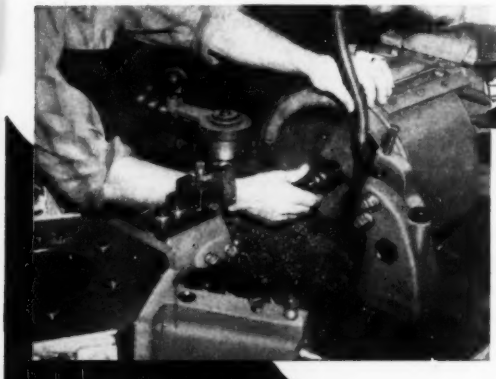
Talk about clever ideas! Here's one used by the Ansul Chemical Company, manufacturer of dry chemical fire extinguishers, to cut time, cut costs and do a better job.

Eight different operations on these gas pressure cartridges are performed on a Gisholt No. 5 Ram Type Turret Lathe as follows: Turn, face, bore, thread, tap, attach splined collar, groove collar, and roll edge. And all in one chucking!

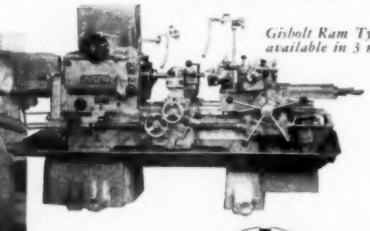
Combining all these operations on a Gisholt Turret Lathe eliminates another handling and welding operation—saves from 30% to 40% of former time. What's more, it has resulted in more uniform work and better appearance.

It's another example of using ingenuity to save money. Gisholt engineers are ready to give you the best of their experience—to help cut *your* time and costs. Write us.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin



While part is still turning, splined collar is placed over neck of cartridge. Collar is then grooved and rolled to insure a snug fit that prevents turning or loosening.



Gisholt Ram Type Turret Lathes are available in 3 models with standard chuck sizes ranging from 8" to 15".

The Gisholt Round Table *represents the collective experience of specialists in the machining, surface-finishing, and balancing of round and partly round parts. Your problems are welcomed here.*

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

TAPPING TECHNIQUES — No. 12

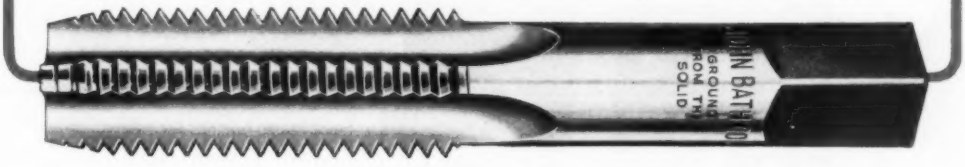
There was a young man who went on a blind date —
And in just a few days, he made her his mate!

He jumped to conclusions and found out too late —
Her beauty was false . . . her curves were all straight!

JOHN BATH CO. INC. · WORCESTER · MASS.

When you order Bath Taps, won't you please stress
Complete and full details! Don't make us guess!

If you want chips to slide along curves that are smooth —
Insist on Bath Taps . . . they're RIGHT "in the groove"!



INSIST ON BATH TAPS . . . PROFIT BY THEIR PLUS-PERFORMANCE

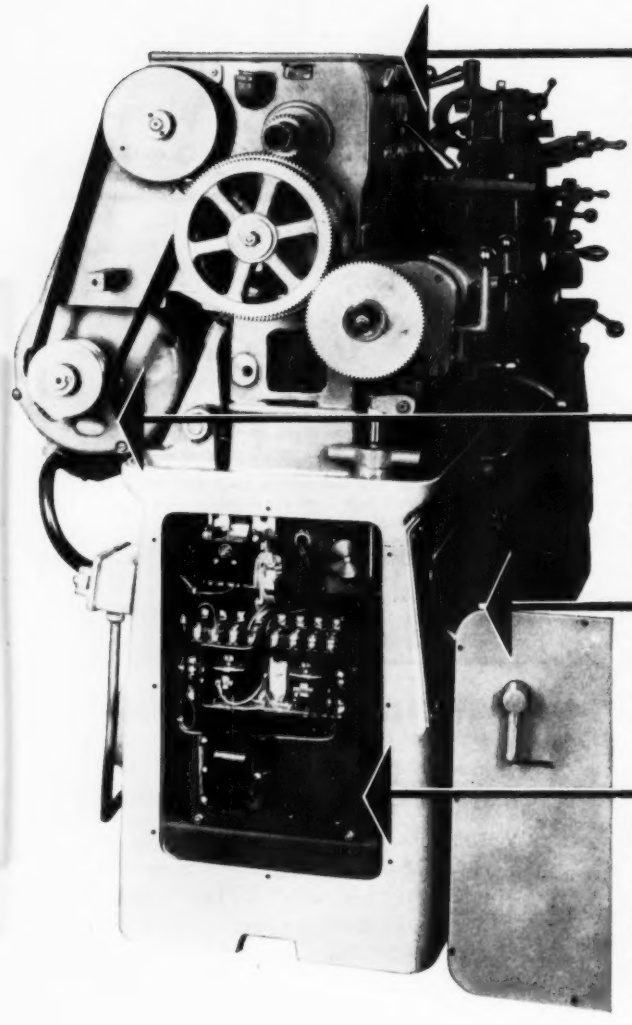
The more we know about your use for Bath Taps, the better we can serve you! Such information will allow us to automatically provide the correct design of tap and apply the proper heat treatment for the metal you wish to tap. The smooth, polished flutes on Bath "ground from the solid" taps, will allow chips to slide, instead of piling up to clog and cause tap breakage.

Full information about the material to be tapped, the machine, fixtures and lubrication will help . . . and in many cases will permit us to make suggestions that will increase your shop productions. See your Bath representative or write direct about your tap problems.

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED
22 Grafton St., Worcester, Mass.

pile it on a tray-top



tops for operator convenience

Tray-Top light duty engine lathe operators save many minutes per hour with mikes, tools, etc., parked on top of headstock and tailstock—right handy, safely off lathe ways and carriage. Direct reading color-match speed selector shifts instantly to any of 12 spindle speeds (all geared, 40 to 1 overall ratio) . . . When you pile work on Tray-Tops, maximum operator convenience pays off in more pieces per hour.

open air maintenance

Another important time and money saving advantage: Tray-Top motors are accessibly mounted thereby reducing down time for maintenance.

"cool" push buttons for safety

220 volts or higher power supply, when used, is stepped down to 110 volts at push buttons and drum switch for maximum operator safety.

blackboard simplicity in wiring

Totally enclosed electrical panel is a model of clean simplicity and safety. Access cover is locked with main disconnect switch. Panel must be dead when cover is off. Before you buy a light duty engine lathe, compare prices and get the whole picture of Tray-Top's outstanding values.

CINTILATHE

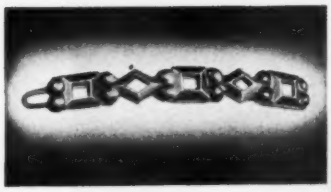
OF OUTSTANDING VALUE

CINCINNATI 9, OHIO, U. S. A. **cincinnati lathe & tool co.**

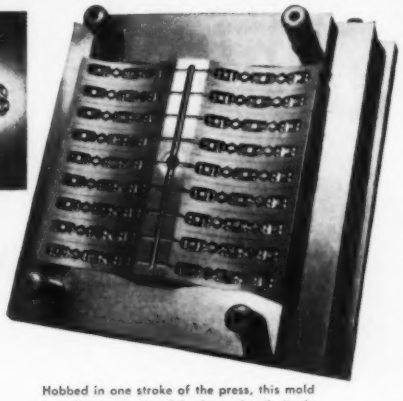
Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributors: Bethlehem Steel Export Corporation



Plastic Molding Takes Special Tool Steels



Hobbed in one stroke of the press, this mold is a fine example of intricate detail. Made from Duramold A, it produces injection-molded barrettes.

Developing a line of tool steels for the plastic-molding industry has been one of the leading jobs during recent years at our tool-steel mill. We've given special attention to hobbing die steels because of the growing demand for improved properties in these grades.

We now offer three excellent grades of hobbing steel: Duramold A (air-hardening), Duramold B (with a boron content), and Duramold C (a straight carbon analysis). Each has advantages for certain types of plastic molding, depending upon the requirements for ease of hobbing, wear-resistance, core strength and resistance to distortion.

Multimold, another new grade, is especially good for mold cavities that are machined rather than hobbed. Our BTR (manganese oil-hardening) and A-H5 (5 pct chrome air-hardening) are excellent for machined molds where higher wear-resistance and core strength are required.

Bethlehem also offers several standard grades for use in making master hobs. 67 Chisel is our outstanding tool steel for this purpose. This chrome-tungsten grade has high strength and exceptional shock-resistance.

Booklet 271 contains details on properties, heat-treatment, and applications of Bethlehem tool steels for plastic molding. It will help you select the right tool steel for hobbed molds, machine-cut molds, and master hobs. It's yours for the asking. Address your request to our Publications Department, Room 1041, Bethlehem, Pa.

Our Tool Steel Engineer Says:

Support Tools in Heat-Treatment, Reduce Warpage

When steels are being heated in the critical range prior to quenching, they are weak . . . and will sag or flow plastically unless supported properly. In heating tools that have sharp corners, an unbalanced design, or thin sections—it's important to heat slowly and uniformly. And be sure that proper mechanical support is provided during the heat.

Safecrackers Foiled by Carbon Tool Steel

A manufacturer of safes couldn't seem to get a suitable grade of steel for clamp bolts in tool-proof safe doors. The bolts needed a tough body to resist snapping when torsion is applied in clamping together a series of heavy, laminated tool-proof plates which make up a safe door. The bolts also had to be very hard on the butt end so that ingenious burglars, who are familiar with the exact location of these bolts, are foiled when attempting to drill holes through the bolts to place explosive charges.

After heat-treated alloy and special steels failed to do the job, Bethlehem carbon tool steel, heat-treated in a simple end-quench fixture, turned the trick.

The customer ordered annealed, shallow-hardening carbon tool steel which meant easy machining of the threads. The machine bolts were then heated all over to optimum quenching temperature. The butt end of the bolt was end-quenched similar to a Jominy test bar. This resulted in a hardened chill at the butt end of about Rockwell C-62 after a low draw. And along the threads the body was tough—about Rockwell C-30.

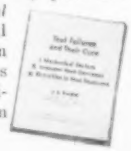
The exacting combination of properties required for this application could be obtained only by the closely controlled hardenability characteristics of our shallow-hardening carbon tool steel.

Ask Us for Free Treatise on Tool Failures

Basing his facts on investigations of several thousand tool failures, one of our tool-steel engineers has written a practical discussion which should help every user of tools to increase his batting average. Entitled *Tool Failures and Their Cure*, the first portion deals with mechanical causes of failures, such as poor tool design, improper grinding, and many other factors.

Problems dealing with faulty heat-treatment and distortion are also described in some detail. The author tells how to make good tools and offers many practical suggestions to avoid the troubles usually encountered in toolmaking.

Added interest is provided by a number of photographs which illustrate various types of failures. Originally published in installments by *Metal Progress*, this helpful treatise is now available in reprint form. Address your request to our Publications Department, Room 1041, Bethlehem, Pa.



Bethlehem ULTRASONIC TESTED **Tool Steel**

From Buckles TO Ball Bearings

Barrel-finished Economically with ALUNDUM Tumbling Abrasive

YES, you can remove burrs, flash, tool marks and heat scale from metal parts—finish large quantities to exact dimensions and degrees of surface finish—and prepare them for plating—ALL IN ONE FAST, ECONOMICAL OPERATION with ALUNDUM Tumbling Abrasive and the barrel-finishing process.

Plants everywhere are saving money by eliminating many slow, expensive, hand-finishing operations and switching to barrel finishing with ALUNDUM Tumbling Abrasive as the finishing medium.

If you don't have barrel finishing equipment in your plant, and if you would like to find out without obligation what this finishing process and this Norton product can do for you—Norton will be glad to make test runs for you.

NORTON COMPANY • WORCESTER 6, MASS.

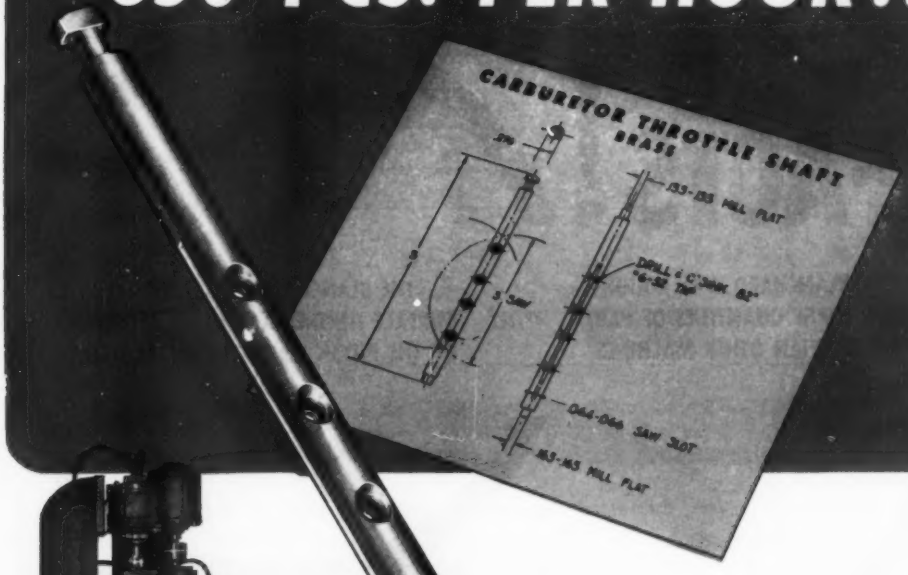
Distributors in All Principal Cities

G-227

NORTON ABRASIVES

Making better products to make other products better

350 PCS. PER HOUR...



milled, drilled countersunk, tapped & slotted on this Hartford Special Automatic Drilling & Tapping Machine

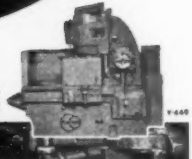
Write for New Bulletin

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD 12, CONNECTICUT

HARTFORD *Special*
...the best buy in the long run

FACTS!

THE BLANCHARD WILL ROUGH GRIND LARGE QUANTITIES OF PARTS FASTER THAN OTHER MACHINES *and* **THE BLANCHARD WILL PRODUCE SURFACE FINISHES AS FINE AS ALLOWED BY THE PHYSICALS OF THE METAL ITSELF**



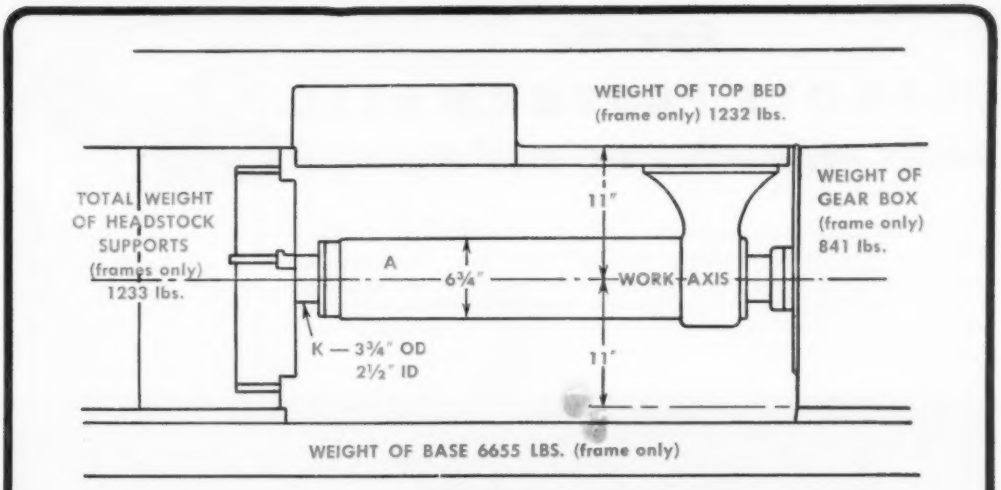
ROUGH GRINDING possibilities with a Blanchard is illustrated by these refrigerator valve plates. 1/16" of stock is removed from both sides of the rough cast iron parts. 44 pieces are ground per load at a rate of 80 pieces per hour (160 surfaces), to limits of ±.002" for size. A No. 18 Blanchard with a Blanchard 30C40 wheel is used.

FINISH GRINDING these valve plates is done on the same Grinder. With 44 pieces on the chuck, a rate of 100 pieces per hour (200 surfaces) is obtained. .003" of stock is removed from each side to limits of ±.002" for size. Surface finish produced on the cast iron is *6 micro inches or better!* A Blanchard 100C15 wheel is used.

Send for your free copies of "Work Done on the Blanchard," third edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**



MAKER OF "HISTORIES"

The above drawing illustrates a Tooling Area that has staged many outstanding cases of machine adaptation and performance. Case histories are very useful as examples of machine adaptation, but their blanket use as unqualified proof of dependable performance is not convincing.

Buyers know that varying requirements and conditions of various plants make "buying what the other fellow buys" an unsafe practice. They know that good case histories will result if machine facilities have been properly selected. No plant could long afford to have it otherwise.

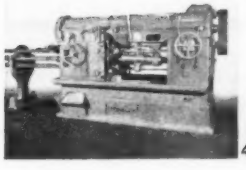
A "top performer" of the 1½" SIX SPINDLE CONOMATIC TOOLING AREA, shown above, is the MAIN END SLIDE. The specific data given tells why:

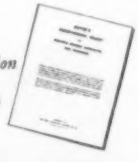
1. **It has a greater maximum load recommendation and a stronger frame support than the main end slide of any other "automatic".**

   The 272 lb. alloy carburized steel Main End Slide, A, is 33⅝" long, and has a maximum load recommendation of 4800 ft. lbs. Its round surface is machined to close limits. It is supported in nickel iron, split, sleeves on the alloy steel Way, K, with a total bearing of 136.9 sq. ins.

2. **It handles more work; has more adaptable tooling positions, and more selective feeds, than the main end slide of any other "automatic".**

   The 27⅞" tooling-length of the Slide handles shaft jobs up to 18" in length. The 2⅝" swing clearance permits die-head threading to full machine capacity in any, or all, six positions without Slide alteration. Nine pairs of pick-off gears give 68 feed changes for each work spindle speed.

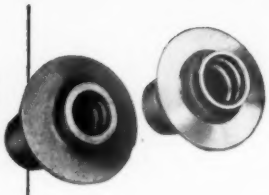


Buyer's Comparison Chart will guide you to full information

A Comparison of ALL Automatics is in Favor of Cone

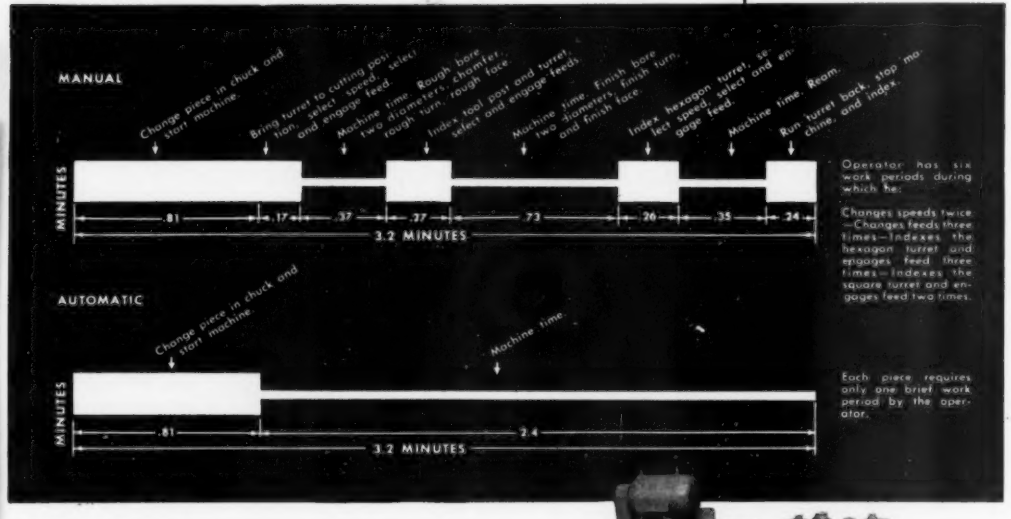
Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

how the
GISHOLT FASTERMATIC
saves man-minutes and money!



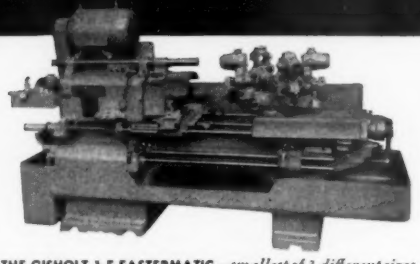
Here is an actual comparison of the time and work cycle of a manually operated turret lathe and a Gisholt Fastermatic Automatic Turret Lathe. The machining of wheel hubs, shown above, requires 6 operations as follows: rough bore, finish bore, ream, rough face, finish face and chamfer. Note that the manually operated machine takes over 54% of the operator's time whereas the Fastermatic takes only 25% of his time, leaving 75% without interruption.


MANUAL
Change piece in chuck and start machine.
Bring turret to cutting position; select speed and engage feed (elec)
Machine time. Rough bore two diameters, chamfer, rough turn, rough face.
Index tool post and turret, select and engage feeds.
Machine time. Finish bore two diameters, finish turn, and finish face.
Index hexagon turret, select speed, select and engage feed.
Machine time. Ream.
Run turret back, stop machine, and index.
MINUTES
.81
.17
.37
.27
.73
.26
.35
.24
3.2 MINUTES
Operator has six work periods during which he:
Changes speeds twice —Changes feeds three times—Indexes the hexagon turret and engages feed three times—Indexes the square turret and engages feed two times.
AUTOMATIC
Change piece in chuck and start machine.
Machine time.
MINUTES
.81
2.4
3.2 MINUTES
Each piece requires only one brief work period by the operator.

That's the story of the Fastermatic in a nutshell—less work time for the operator. The Fastermatic handles all changes of feeds and speeds automatically.

In this case, for example, the other side of the work piece is done by another Fastermatic with substantially the same cycle. One operator keeps both machines constantly under cut and still has ample time for stacking and work inspection. Important, too, is the fact that both Fastermatics are tended by a comparatively unskilled operator.

There are many such cases where Fastermatics can cut costs substantially. Gisholt engineers will gladly answer your questions. Write us.



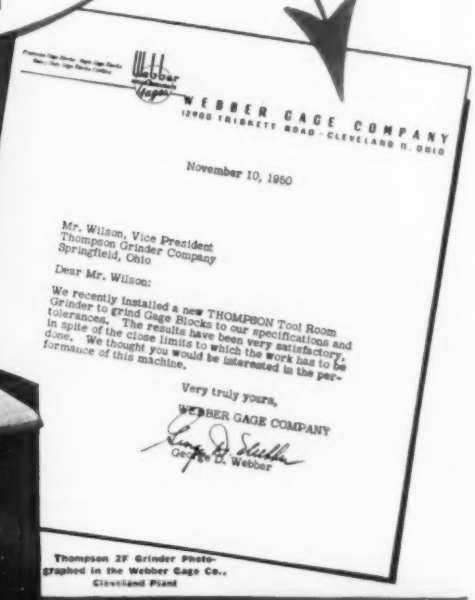
THE GISHOLT 1-F FASTERMATIC—*smallest of 3 different sizes which enable you to machine a maximum number of surfaces in one chucking, handling all changes in speed and feed automatically. On this job, turret was double-tooled so that two parts were completed with each revolution of the turret. Ask for literature.*

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.*

Here's Proof

The New Thompson Type 2F is a SUPER PRECISION Tool Room Grinder



WEBBER GAGE COMPANY
12908 TRIBKETT ROAD · CLEVELAND 11, OHIO

November 10, 1950

Mr. Wilson, Vice President
Thompson Grinder Company
Springfield, Ohio

Dear Mr. Wilson:

We recently installed a new THOMPSON Tool Room Grinder to grind Gage Blocks to our specifications and tolerances. The results have been very satisfactory, in spite of the close limits to which the work has to be done. We thought you would be interested in the performance of this machine.

Very truly yours,
WEBBER GAGE COMPANY
George D. Webber

Thompson 2F Grinder Photographed in the Webber Gage Co., Cleveland Plant

COMPARE THIS NEW 8 x 10 x 24 TOOL ROOM GRINDER

When working to a tolerance of four millionths of an inch such as is observed when making Webber Gage Blocks, the rough or preliminary grinding plays an important role in keeping cost of the final finishing within reasonable limits.

Compare These Features:

- HARDENED AND GROUND cross slide ways completely sealed.
- One shot lubrication to cross slide ways and internal saddle bearings.
- HARDENED AND GROUND sealed anti-friction vertical slide.
- HARDENED AND GROUND BED WAYS with automatic lubrication.
- 3600/1800 R.P.M. 2 speed wheel head. Heavy alloy steel spindle heat treated, runs in super precision ball bearings accurately preloaded, lifetime lubricated. Handy control panel.
- Elevation micrometer stop graduated in .0001".
- GROUND THREAD FEED SCREW.
- Automatic wheel TRUING device.
- Longitudinal hand wheel with automatic engagement.
- Hydraulic head movement throttle with rapid traverse.
- Hydraulic table movement throttle.
- Elevating hand wheel graduated in .0005".
- GROUND THREAD FEED SCREW.

WRITE TODAY for complete specifications and performance data. Address Dept. 10, Thompson Grinder Co., Springfield, Ohio.

COPYRIGHT 1951 BY THE THOMPSON GRINDER CO.

The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders for industry.

Thompson SURFACE Grinders

The Thompson Grinder Company, Springfield, Ohio

Precision by the ton

An automobile hood is not only a fairly large stamping, but because it is seriously unbalanced in shape from front to back, dies have a tendency to rock as pressure is applied.

The big 4-point, 1500-ton capacity Clearing in this picture, at the Kaiser-Frazer Willow Run plant, is turning out this job in ideal fashion. The multiple suspension, plus the Clearing crankless principle and generous gibbing, keeps the dies true despite severe load unbalance. That means long die life and few production interruptions. If you're interested in the details, we'll be glad to supply them.

CLEARING MACHINE CORPORATION

6499 WEST 65TH STREET • CHICAGO 38, ILLINOIS

CLEARING PRESSES

THE WAY TO EFFICIENT MASS PRODUCTION

CMC CLEARING

*What's in Vermont this month?**

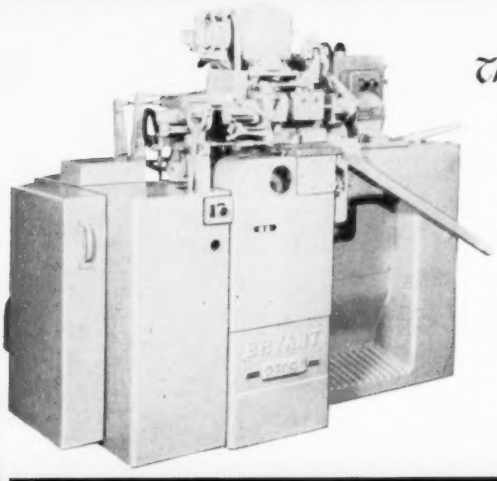
YOU CAN CUT HOLE GRINDING COSTS THIS WAY. A look at the balance sheet proves the importance of "machine power" as opposed to "man power". The Bryant No. 2209 Internal Grinder offers all the advantages of "machine power" to the mass production of precision holes. It is fully automatic so that a single operator can run several machines. Small parts are placed in an automatic loader. The No. 2209 *automatically* loads, rough grinds, trues the wheel, finish grinds to size, then ejects the finished part. This machine not only saves man power, but 1) gives high production, 2) saves floor space, 3) costs less initially than several semiautomatic grinders necessary to give the same production, 4) saves on wheel costs, 5) produces parts consistently to specified tolerances, 6) reduces scrap loss.

Bryant Chucking Grinder Company is prepared to give you accurate figures on production and costs so that your management can translate them into terms of investment. Send your present production figures to Bryant now. We will give you data which may help you buy that new machine.

* Remember . . . it won't cost to inquire!

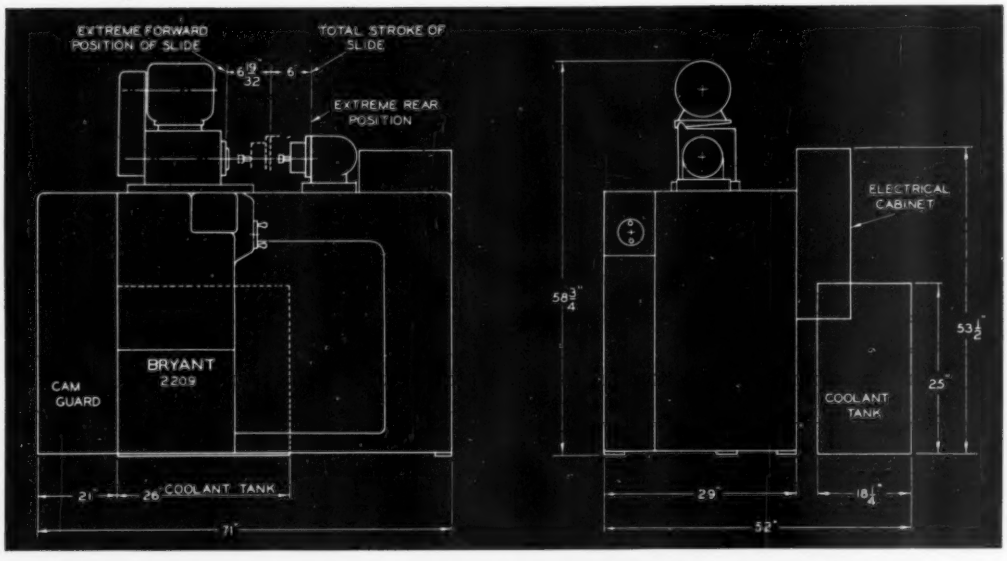
Bryant Chucking Grinder Company in Springfield, Vermont, U.S.A.

FOR HOLE GRINDING

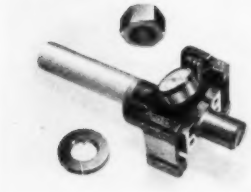


The Bryant 2209 Precision Hole Grinder

This machine is designed particularly for high production, precision grinding of bores from $\frac{1}{4}$" to 3" in ball bearing races, gears, rolls, bushings, etc. The entire cycle mechanism is a combination of cam and lever. The cycle is fully automatic as follows: load, rough grind, true wheel, finish grind, and unload. Automatic loading allows a single operator to handle a large battery of machines — his duties consisting only of loading hoppers and changing wheels. Wheel speeds up to 100,000 R.P.M. are obtained with the Bryant Hi-frequency wheelhead. Write for folder.



FOR CHECKING INTERNAL THREADS



The Bryant Portable Thread Gage

This is basically a split plug gage. Segments are collapsed and inserted into threaded hole. When expanded, they contact all threads. A partial turn of gage gives accumulated reading of P.D. form and lead on dial indicator — for the first time allowing parts to be sorted into known classifications for fit. *4 to 5 times faster than plug gaging!* Standard range from $\frac{1}{16}$" to 1" I.D. Write for complete details.

Bryant Chucking Grinder Company in Springfield, Vermont, U.S.A.

ANOTHER EXAMPLE OF

DESIGN LEADERSHIP*

SQUARE D's NEW MAGNET-OPERATED VALVE

- **Fast Operation**—Direct-acting magnet . . . low inertia . . . up to 600 cycles per minute on intermittent duty basis.
- **Low Pressure Drop**—Internal cross-sectional area greater than ⅜" pipe area . . . minimum resistance to flow.
- **Long Life**—Pressure-balanced rotor . . . manganese-bronze valve body . . . hardened magnet parts . . . bronze oilite pivot bearings.
- **Low Power Consumption**—Magnet coil requirement 38 VA at 60 cycles—inrush 215 VA.
- **Compact**—Unique valve design permits small magnet structure . . . overall valve size only 5¾" x 6½" x 4".
- **Accessible**—Valve body or magnet structure removable without disturbing pipe connections . . . magnet coil easily changed.
- **Easy Installation**—Valve mounts in any position . . . cast base with 3-point mounting reduces distortion possibility.
- **Pressure Range**—Efficient operation on air pressures up to 100 p.s.i.

Write for Bulletin 9043 Type C, Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

Shop Set MTT . . . 35 blocks giving 140,000 combinations in ten thousandths. Price in mahogany case, $100.00.

Economy Set MT . . . Over 5000 combinations in thousandths. Price in mahogany case, $40.00.

Micrometer Set M21 . . . Includes 1", 2", 3", 4", 5", and 6" Microgages. Price in mahogany case, $80.00.

Toolmakers Set M64 . . . Gives 121 combinations in 16ths, 32nds and 64ths. Price in mahogany case, $17.50.

The New Van Keuren

7/8 DIAMETER MICROGAGES are the best buy . . . . . .

60% More Wearing Surface . . . 25% Greater Accuracy . . . No increase in price.

A FOUNDATION FOR ACCURACY FOR 25 YEARS

Van Keuren Microgages have been popular for over 25 years, because they provide a low cost means of securing accuracy in the shop, to meet the demands of the inspection department. The original Microgages were made 11/16" in diameter. The 7/8" body diameter of the NEW Microgages are ground true cylinders, and the end surfaces are held square with the body within close limits. This enables them to be easiily aligned on machine ways for measuring carriage travel. The new Microgages have 40% more wearing surface than rectangular gages and they wring together tenaciously. The 7/8" diameter body provides excellent rigidity for the 6" long blocks.

Microgages up to 1" length are held within a tolerance of plus 12 millionths minus 8 millionths. They have an average wear allowance of 4 millionths oversize. They are available as individual gages from .0625" to 6" length, or in sets especially designed for general shop use, for tool setting and for tool makers and machinists.

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

32nd YEAR

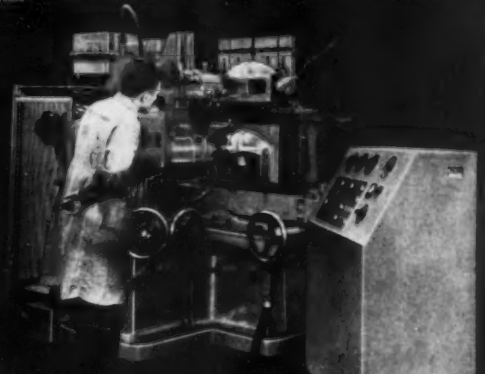
Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

NEWEST IN KELLERING

for accurately reproducing any contour — in any material — from any master form...

Kellering isn't new. But this P&W advanced Type BL Keller Machine is! It incorporates important improvements in controls, feeds, range of travel and operating speeds to do a better, faster job of producing dies, molds, patterns, prototypes and short-run parts. With it, you'll reduce costs, machining hours, hand finishing. And you'll duplicate any template, any model — 2 dimensional and 3 dimensional — more accurately and much more profitably.

Our recently published bulletin tells why Kellering on the new Type BL is modern, automatic tracer-controlled milling at its best. Ask any P&W Branch Office for your copy of the new Type BL Keller Bulletin.



NEW
24" x 16"
36" x 20"

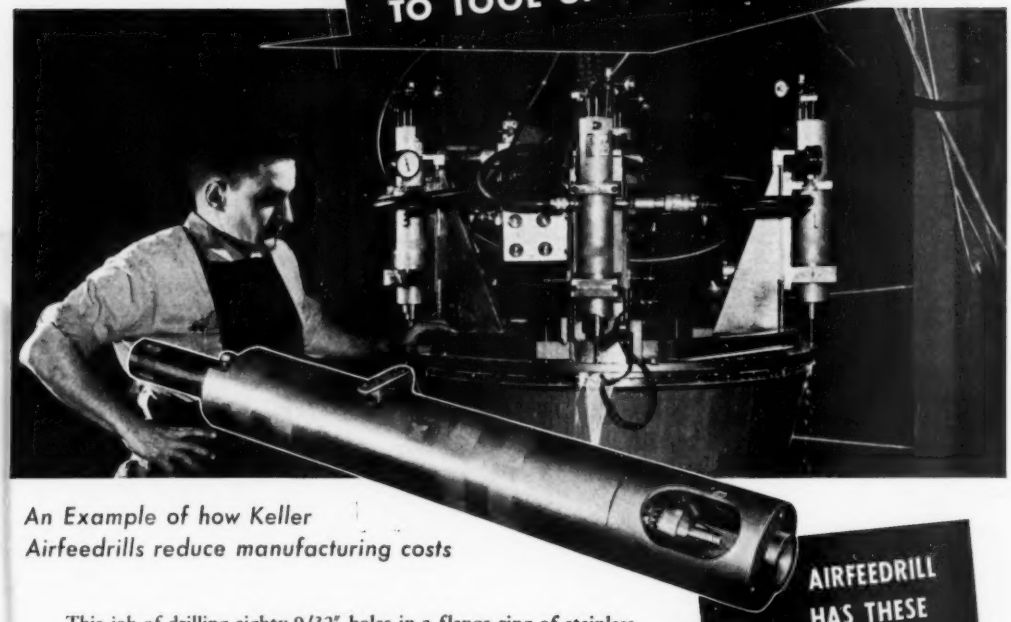
TYPE **BL**
KELLER MACHINES

PRATT & WHITNEY
Division Niles-Bement-Pond Company
WEST HARTFORD 1, CONNECTICUT

Branch Offices: Birmingham · Boston · Chicago
Cincinnati · Cleveland · Detroit · Los Angeles · New York
Philadelphia · Pittsburgh · Rochester · St. Louis · San Francisco
Dallas and Houston (The Stanco Co.) · Export Dept., W. Hartford, Conn.

$4,500 instead of $45,000

TO TOOL UP FOR THIS JOB!



An Example of how Keller Airfeedrills reduce manufacturing costs

This job of drilling eighty 9/32" holes in a flange ring of stainless S-155 would, by "conventional" methods, require a six foot radial drill press. In the tooling budget, $45,000 was allocated for the entire job.

But the methods engineer had a better idea. He made up an indexing table and fixtures on which he mounted multiple Keller Airfeedrills. At a complete tool-up cost of only $4,500 ($2,500 for table and fixtures, $2,000 for Airfeedrills), he obtained results so satisfactory that today similar production methods are being adopted by other manufacturers for similar jobs.

When a job comes up that calls for drilling, think of Airfeedrills FIRST and decide if it is applicable. This versatile new tool operates automatically . . . by a single pressure of the control button it advances, drills, retracts, and shuts off. Descriptive literature will be sent gladly on request.

AIRFEEDRILL HAS THESE 5 GREAT ADVANTAGES

- Easy and economical to set up
- Fixture setups need not be permanent
- Usable in existing fixtures by mounting Airfeedrills in bushing holes in fixture
- Fast and accurate automatic control
- Smallest known diameter for rated drilling capacity. Five sizes, speed from 200 to 12,000 rpm

KELLER *Pneumatic Tools*

K KELLER TOOLS

KELLER TOOL COMPANY
GRAND HAVEN, MICH.

. . . at WESTERN ELECTRIC
Telephone Exchange Parts Precision Broached on Oilgear Machines

Oilgear Broaching Machines have been used by the Western Electric Company plants for many years . . . in some cases as far back as 1928. This great telephone and communications equipment manufacturer uses Oilgear Horizontal and Vertical Broaching Machines for finishing many delicate precision parts that go into telephone exchange assemblies.

In the scene above, three Oilgear single slide vertical surface broaching machines are used to finish various types of magnetic core pins. The first two machines finish broach two flats and a groove on 4 pins per cycle. Production on each machine is in excess of 1600 pieces per hour. The third machine broaches on each pass four 23/32" flats which have been butt-welded to round pole pieces. Production is better than 400 pieces per hour.

Oilgear Broaching Machines have many features which are available only on Oilgear Machines *at no extra cost*. Here are some of these features. Oilgear two-way reverse flow variable delivery pumps have an efficiency of 90% at full load. You get higher, independently adjustable, cutting and return speeds, and positive broaching speed up to 150% overload. The patented electro-hydraulic control is integral with the pump and eliminates valves and piping. Power is *saved* because power is *used* only in proportion to the load . . . because power is reclaimed on return stroke . . . because there are no valves to waste power. The Oilgear system is a simple system. It uses less piping, is accessible yet compact. Wider slides and tables on Oilgear Machines allow broaching of 2 or more parts per cycle. Oilgear also has longer tool slides, and longer ways. Pre-loaded work tables offer closer broaching tolerances and smooth, harmonic operation. For further information, write: THE OILGEAR COMPANY, 1563 W. Pierce St., Milwaukee 4, Wisconsin.

Oilgear **PIONEERS IN FLUID POWER**

BROACHING MACHINES AND PRESSES

...THE INSIDE STORY OF THE "FLYING DISCS"...

People say that they've seen flying discs.

They say they're bright shiny metal, 90 feet in diameter, and travel at incredible speeds. Reports about them always seem to make page one.

Another kind of "flying disc" that never rates a headline is made of black wax. It's about 16 inches in diameter, and it, too, flies at incredible speeds.

We're speaking of radio transcriptions that fly by Air Express.

They don't get page-one mentions because, by now, the idea of flying discs to the various stations is commonplace to the radio industry. The time they save permits them to keep their recorded broadcasts right up to the minute.

But, you don't have to be in radio to profit from the regular use of Air Express. Here are unique advantages which any business can enjoy:

IT'S FASTEST—Air Express gives the fastest, most complete door-to-door pick up and delivery service in all cities and principal towns, *at no extra cost.*

IT'S MORE CONVENIENT—One call to Air Express Division, Railway Express Agency, does it all.

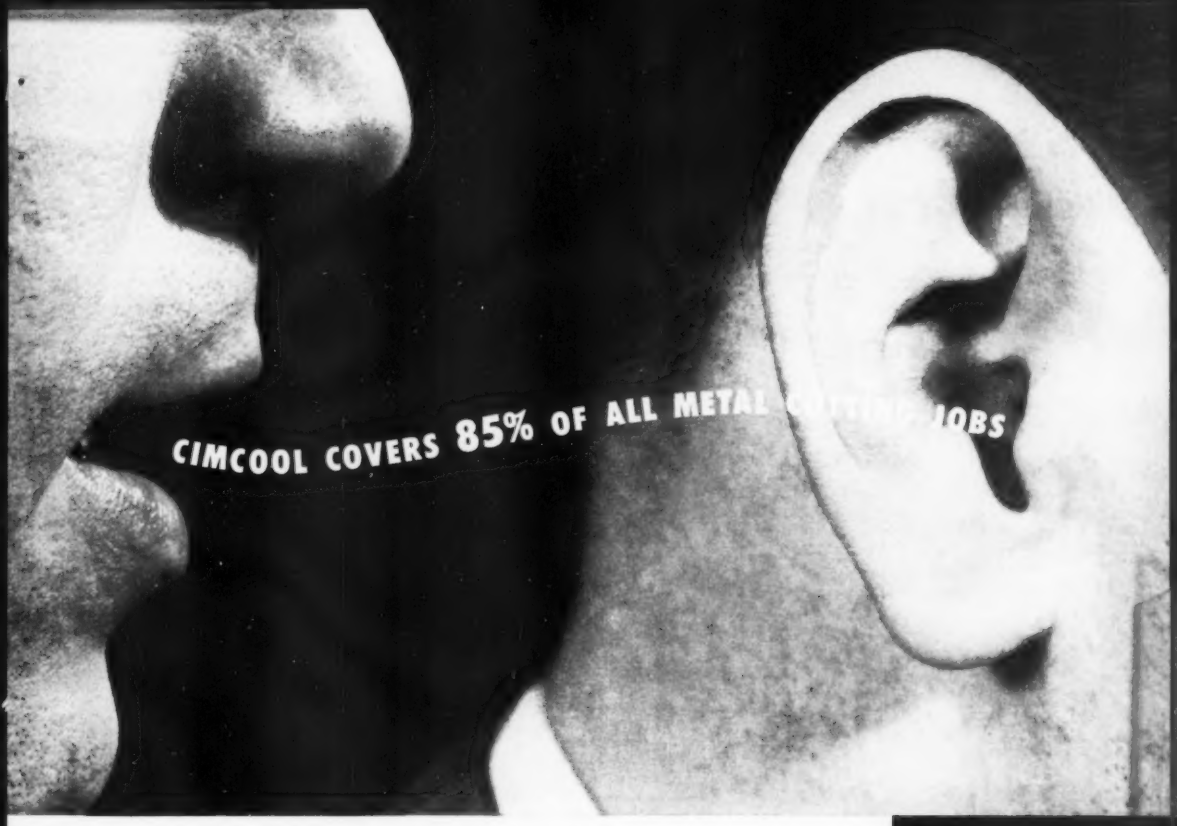
IT'S DEPENDABLE—Air Express provides one-carrier responsibility all the way and gets a *receipt upon delivery.*

IT'S PROFITABLE—Air Express expands profit-making opportunities in distribution and merchandising.

Like to know more? Call your local Air Express Division of Railway Express Agency.

AIR EXPRESS

GETS THERE FIRST



You hear it everywhere...

Everybody likes to pass along good news. And CIMCOOL° is the *best* news in years, for this radically new and different cutting fluid replaces all water emulsions and all but a few highly compounded specialty oils.

And operators will tell you that Cimcool *does a better job!*

That's because Cimcool is a chemical emulsion which combines friction reduction and cooling capacity in a degree never before attained by old-fashioned cutting fluids. You get longer tool life, and there's less down time. Cimcool is longer lasting in machines, too . . . and reduces the cost of cleaning and changing. Furthermore, Cimcool permits faster speeds. So no wonder more and more metal cutting shops are switching to this revolutionary coolant.

We honestly believe that one week's run will convince you. And we'll be happy to provide a demonstration in one of your own machines. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you —without cost or obligation, of course. If you prefer, write for our free booklet "CIMCOOL Gives the Answers." Address Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

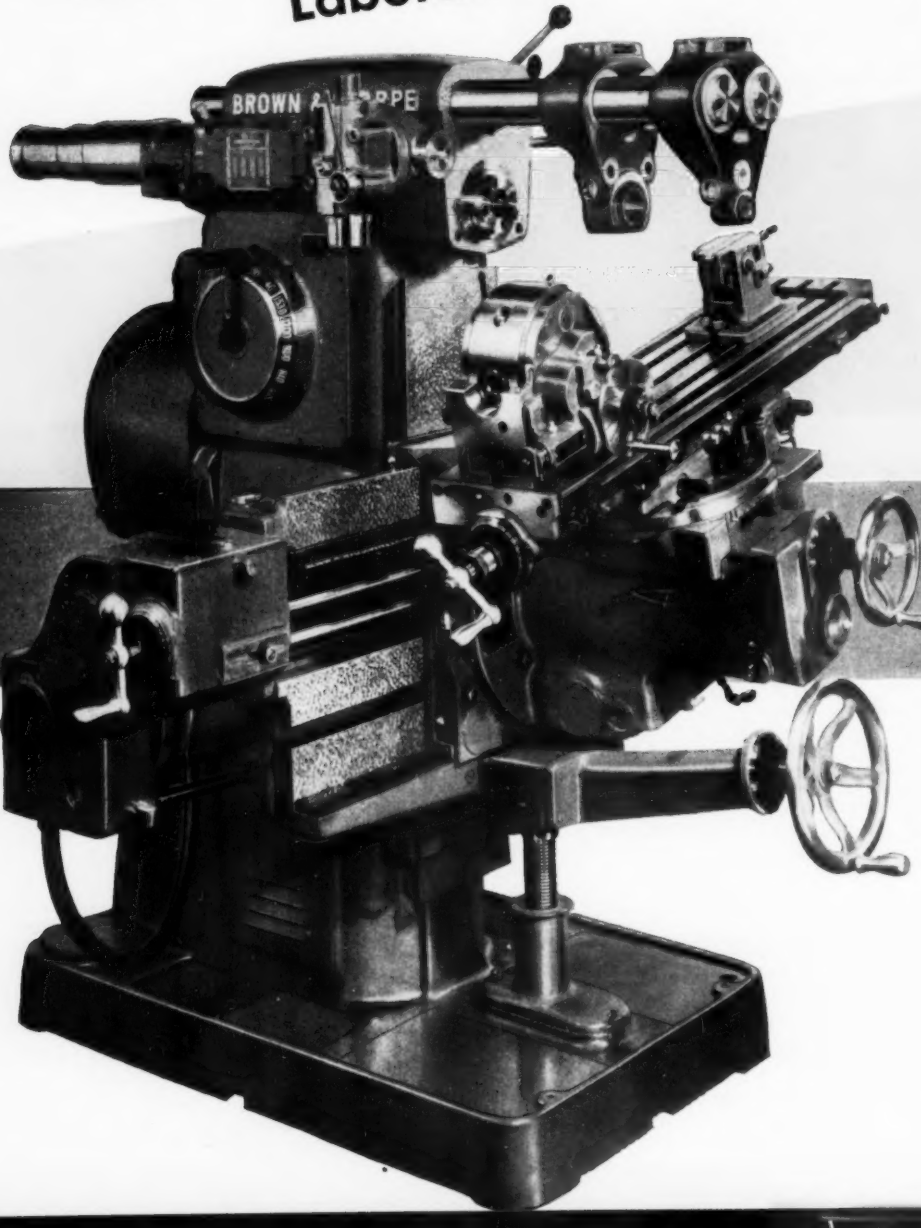
°Trade Mark Reg. U.S. Pat. Off.

A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO.

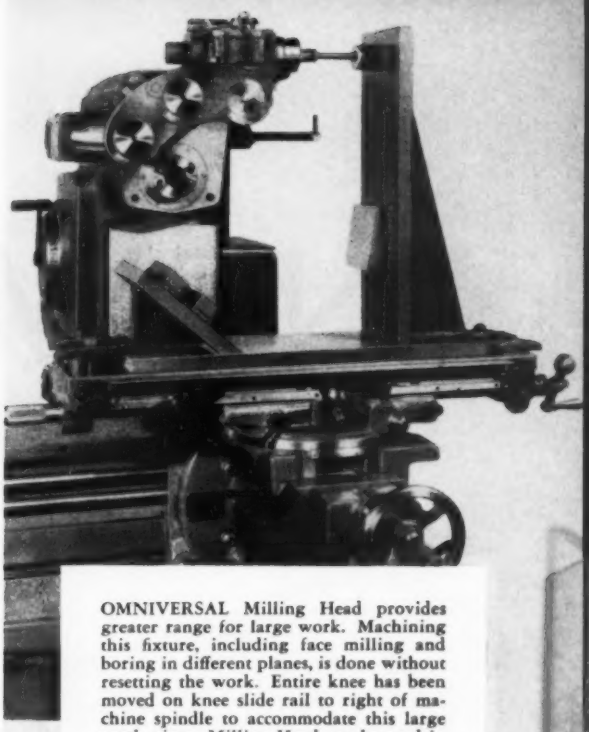
for 85%
OF ALL METAL CUTTING JOBS

The New OMNIVERSAL

for Toolrooms, Experimental and Research Laboratories



Milling a bevel gear illustrates the versatility of the OMNIVERSAL. Work is held on original centers, eliminating truing and maintaining concentricity. Headstock and footstock provide greater support and save time. Knee is readily swiveled to 60° either side of horizontal. The vernier on knee reading to 2 minutes of arc assures greater accuracy.



OMNIVERSAL Milling Head provides greater range for large work. Machining this fixture, including face milling and boring in different planes, is done without resetting the work. Entire knee has been moved on knee slide rail to right of machine spindle to accommodate this large work piece. Milling Head can be used in three column positions further increasing the machine's versatility.

Brown & Sharpe

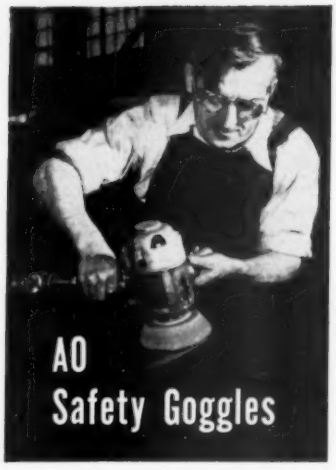
...the milling machine with unparalleled versatility!

This is it — the ultimate in milling machine versatility! The new Brown & Sharpe No. 0 Omniversal Milling Machine performs a wide variety of work without the need for attachments, jigs, or fixtures. Ideal for toolrooms, experimental and research laboratories, — also repair shops and small-quantity production plants.

For all normal milling operations and the unusual applications demanding highest precision, there is no substitute for the OMNIVERSAL. Ability to mill simple or compound angular surfaces or to drill and bore at angular settings permits complete machining without resetting work on table. Milling tapered work on Index Centers no longer requires swiveling head and footstock or special fixtures. Taper spirals are readily milled.

The result is greater accuracy with a saving in both set-up and machining time.

Get the complete story on this outstanding machine. Write Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.



NOW...

AO 7000 METAL SAFETY GOGGLE

WITH PERMANENTLY ATTACHED SIDESHIELDS*

*(No removal necessary when replacing lenses)

Here is a goggle with all the safety values of its predecessor but with added new features for greater convenience, more attractive appearance and longer life. Of major importance are the NEW TEMPLES, STREAMLINED ENDPIECES, BEADED ENGRAVED EYEWIRE and the PERMANENTLY ATTACHED SIDESHIELDS. Your nearest AO Safety Products Representative can supply you with this top quality eye protection.

Quick Facts

- NEW TEMPLES — Insulated from center to ear end with *brown* tubing that will not discolor and will outlast temple. Easily-adjusted, perspiration-proof, oval-shaped. Both temple and endpiece screws are patented AO "Evertite"— keep tight yet remove quickly when desired.
- STREAMLINED ENDPIECES — On-center with a wide bearing surface to minimize temple drop. Beaded engraving and flush screw heads for attractive appearance.
- BEADED ENGRAVED EYEWIRE — Contributes looks with ruggedness. Eyewire is flat, has engraved bar across top. Smaller sideshield flange has rolled edges.
- SIDESHIELDS — Permanent attachments to eyewire save time and an operation when replacing lenses.
- LENSES — FV-3 shape drop eye — accommodates clear or calobar regular Super Armorplate or 6 curve Super Armorplate lenses. Two eye sizes: 44 and 47 with or without side shields.

American Optical
COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

HOLES PER GRIND *increased from 8 to 83!*

The *Right* CLE-FORGE stock drill gives spectacular performance

A farm implement manufacturer had trouble drilling small, deep holes in a 1019 steel shaft. Regular drills burned on the corners and gave only 3 to 8 holes per grind. When a *Cleveland* Service Representative was called in, he recommended the special purpose CLE-FORGE High Speed Drill, a stock item, illustrated here. Speed and feed remained the same. The CLE-FORGE High Speed Drills averages *ten times more* holes per grind! There are several special purpose CLE-FORGE High Speed Drills, regularly stocked by your Distributor, which often can help you solve a difficult drilling problem. A *Cleveland* Service Representative will be glad to advise you. Contact our nearest Stockroom, or . . .

Telephone Your Industrial Supply Distributor

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THE MARK OF QUALITY FOR 75 YEARS

THE CLEVELAND TWIST DRILL CO.
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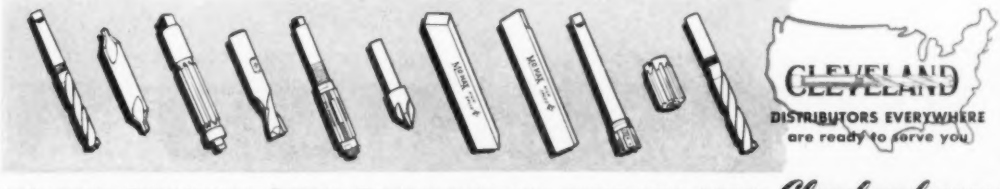
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 1 • San Francisco 5 • Los Angeles 58
E. P. Barrus, Ltd., London W. 3, England



CLEVELAND
DISTRIBUTORS EVERYWHERE are ready to serve you

ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS

Full Automatic Cycle

. . . enables one operator to attend two BARDONS & OLIVER HEAVY DUTY MILL TYPE CUT-OFF MACHINES

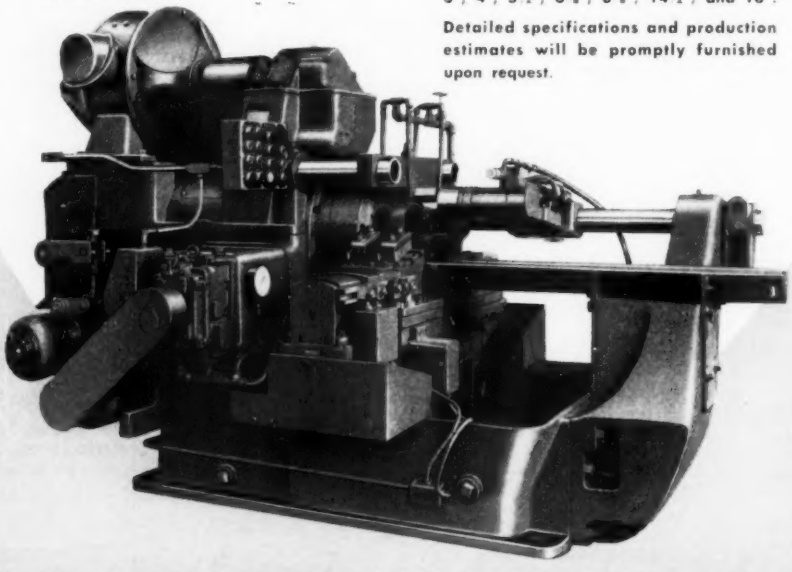
Increased output per machine is obtained because idle time is reduced to a minimum

Outstanding Features:

1. A variable-speed, direct current motor provides the proper cutting speed for each diameter and material.
2. Double (front and rear) Cut-off Slides have hydraulic rapid traverse, feed, and rapid return.
3. Two or more coupling blanks can be cut off at one time.
4. Machines can be made in pairs (left hand and right hand) for easier control by one operator.
5. Outside chamfering attachments are available and do not reduce the output of the machine.
6. A fully automatic loading table can be furnished to function in timed relation to the machine cycle. A continuous flow of parts is thus obtained with minimum effort.

Fully Automatic, Mill Type Cut-off Machines with the above features are offered in seven sizes, with maximum capacities as follows: 3", 4", 5½", 6⅝", 8⅝", 14½", and 16".

Detailed specifications and production estimates will be promptly furnished upon request.



WE ALSO BUILD A COMPLETE LINE OF RAM AND SADDLE TYPE TURRET LATHES

BARDONS & OLIVER, INC.

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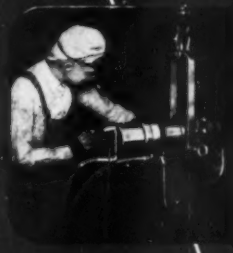
Here's what Hannifin Builds to help you

HANNIFIN

SAVE TIME!
CUT COSTS!

Standardized HYDRAULIC PRESSES

Hannifin offers one of the broadest lines of fast, modern hydraulic presses built for industry today—more than 75 standard models, *plus* many special designs in a complete range of sizes from 1 ton to as high as 200 tons. Straightening Presses... Forcing Presses... Column Type Presses—all specifically designed to help cut costs, save time, and do a better job! For recommendations, call in your nearest Hannifin representative or submit specifications. *For information, ask for a copy of Bulletin 130.*



"Hy-Power"

RIVETERS • PUNCHES • PRESSES

Investigate this revolutionary Hannifin-developed production technique for using up to 5,000 p.s.i. hydraulic pressure under safe, trouble-free, completely automatic control. For "silent squeeze" riveting, punching, pressing, multiple riveting, multiple punching, and many similar operations. Used by every leading automobile manufacturer and by many metal fabricating and machinery building plants as well. *For complete information, ask for a copy of new Bulletin 150.*

Cylinders

HYDRAULIC • PNEUMATIC

Hannifin sets the standard for quality—None Finer! This is the cylinder that *completely* meets J. I. C. Hydraulic Standards. 12 standard bore diameters, 1" to 8" ... any length stroke ... cushioned or non-cushioned. 11 standard mounting styles; double end rods available in most styles. Also specially designed cylinders for O. E. M. applications. *Bulletin 110.*

For dependable, long-lasting, full-power performance, use Hannifin Air Cylinders. Standard the world over for all industrial applications. 12 standard bore diameters, 1" to 16"... Any length stroke you specify... 6 standard mounting styles... plus combination mountings and double end rod styles... available with adjustable cushions. *Bulletin 210.*

AIR CONTROL VALVES

Hannifin leads with latest and newest types of air control valves. Exclusive designs for every purpose! Precision built to provide fast, effortless control of cylinders, presses, and other air operated equipment. Electric or manually operated by hand or foot. Also Speed Control Valves, Pressure Regulators, Air Filters, and Air Line Lubricators. *Ask for catalogs.*

AIR PRESSES

Here's the answer when you need fast, efficient, low cost production with a minimum investment in equipment! Use Hannifin Air Operated Presses for staking, punching, broaching, assembling, forming, oil grooving, riveting, and other operations. 59 different models, ½ ton to 18 tons, for bench or floor mounting. Hand, foot, or electric push button controls. *Send for descriptive literature.*

Nationwide Sales and Service

HANNIFIN CORPORATION

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol Cutting Oil 33-DA

TOOL Files—saw sharpening machine

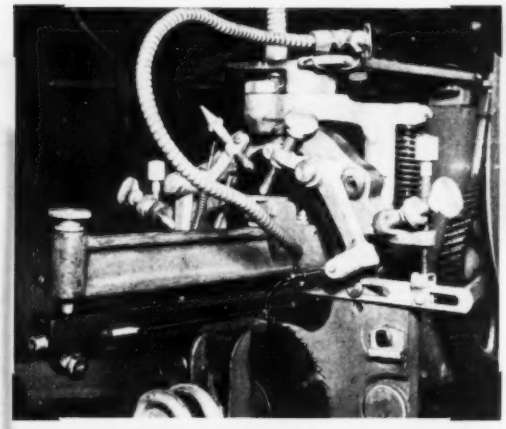
LUBRICATOR Circulating flow onto work

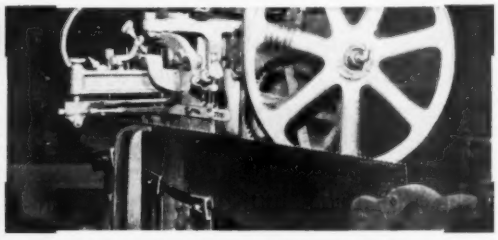
SERVICE All types saws for contractors, printers, etc.

CONDITIONS High temperatures and pressures—metal dust

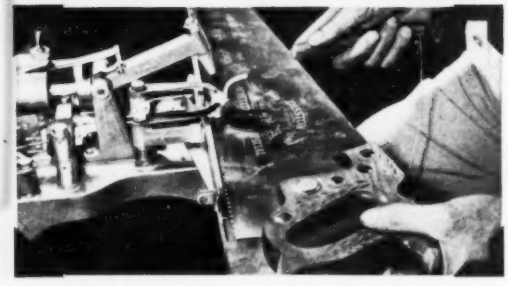
FIRM H. Murray Co., San Francisco

Special oil reduces cutting-tool costs 78%!



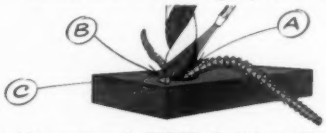


WHEN COMPOUNDED CALOL CUTTING OIL 33-DA replaced a comparable type competitive oil on this filing machine, the work output of each file was increased from 24 saws to 110 and "shut-down time" shortened materially. Circulated by a sump pump onto the tool and work, CALOL Cutting Oil 33-DA preserves the fine cutting edges of the three-cornered files used, keeps them cleaned of metal dust and completely cool. This machine sharpens printers' saws (left), handsaws (above) and band saws.



AN AUTOMATIC SAW-SET MACHINE is used in the shop. Saws are sharpened regularly under contracts with large building contractor concerns and others.

How to up efficiency in all metal-cutting operations



Use the correct CALOL Cutting Fluid for any operation from grinding to broaching. Recommendations for each are made from actual working results.

A. Have high cooling and lubricating qualities—minimize "built-up edge" and promote good finish.

B. Flush away cuttings readily.

C. Protect machine and work against rusting and corrosion.

REMARKS: CALOL Cutting Oil 33-DA is only one of many cutting and soluble oils in the complete line made by Standard of California. There are 4 general types for all kinds of metal machining: Mineral oils, ready-mixed compounded oils, concentrates, and soluble oils.

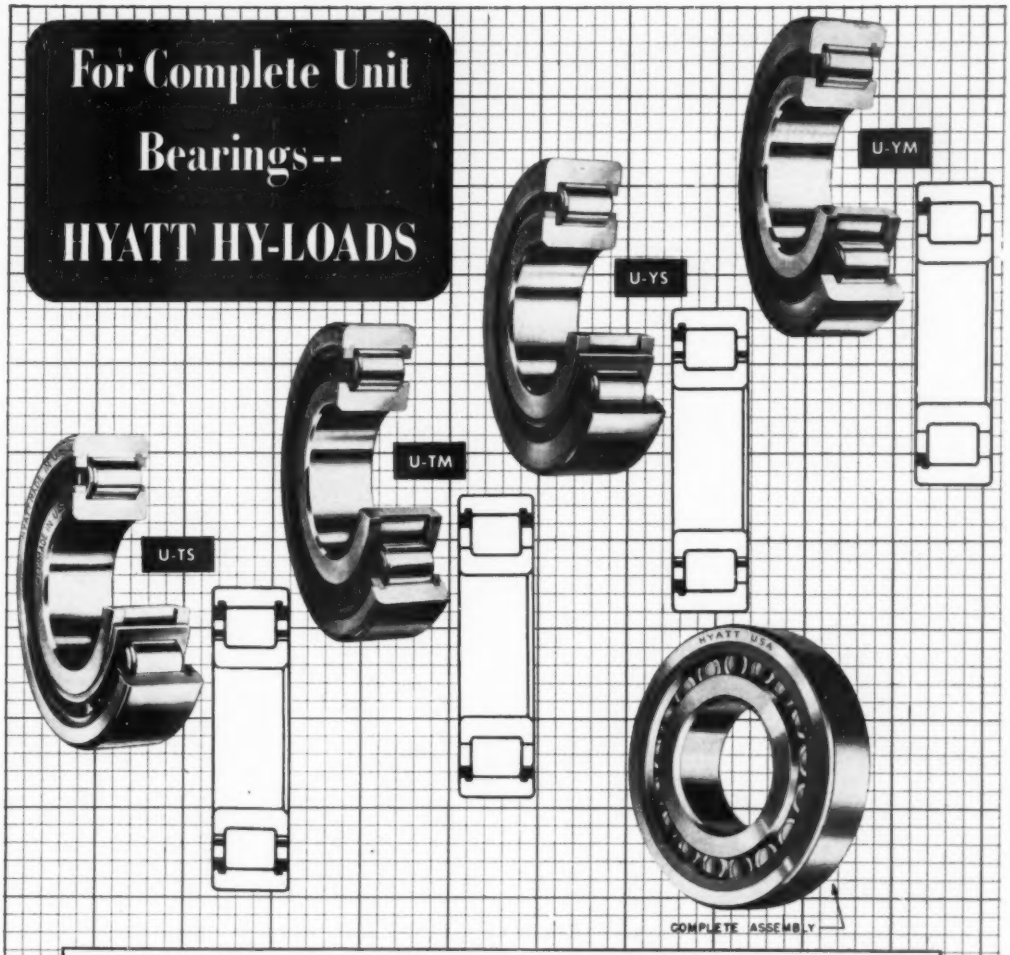
CALOL

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA • San Francisco
THE CALIFORNIA OIL COMPANY • Barber, N.J., Chicago, New Orleans
STANDARD OIL COMPANY OF TEXAS • El Paso, Texas
THE CALIFORNIA COMPANY • Denver, Colorado

For Complete Unit Bearings-- HYATT HY-LOADS



IN the Hyatt Hy-Load line of cylindrical roller bearings there are the non-separable types where the rollers, separator and races are assembled into a single unit. They are made for applications where the bearing must be assembled as a complete unit. They also may be used in applications where no shoulder stop is provided to retain the outer race endwise.

Two of these non-separable types are made with cages or separators in which the rollers are pocketed between the inner and outer races. The two other types have a full complement of rollers and therefore are able to carry greater load capacity than is possible with a cage type bearing.

• • •

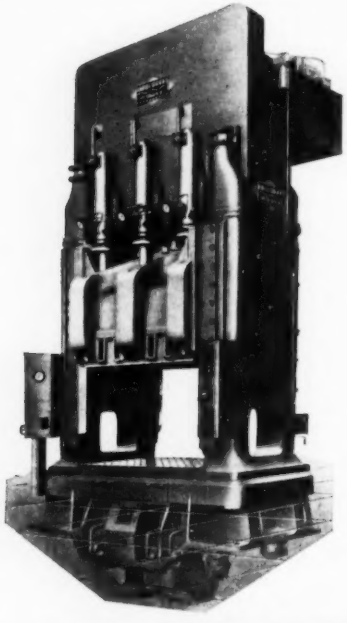
Complete information about the use of these and all Hyatt Hy-Load Roller Bearings is contained in Catalog 547... a complete engineering guide to radial bearing selection and use. You will find that Hy-Load Bearings with the large selection of bearing types and the wide range of sizes which are made in every type will fit almost any application need. Write for your copy of Catalog 547 today. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

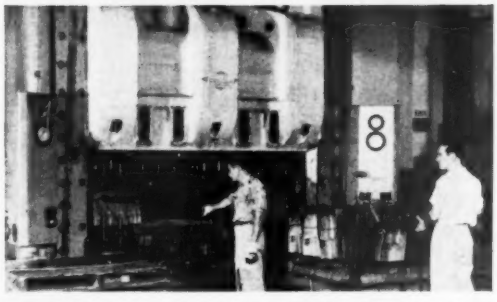
HYATT ROLLER BEARINGS

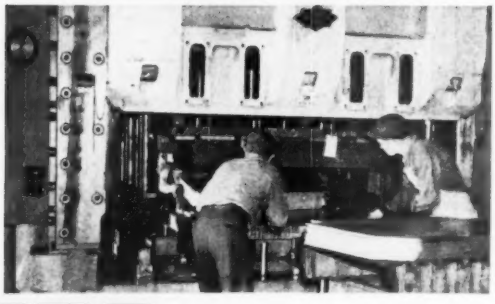
BIRDSBORO
HYDRAULIC

Look Behind This Trade-Mark for

ADVANCED ENGINEERING
HIGH PRODUCTION
TROUBLE-FREE OPERATION
in
Hydraulic Metalworking Presses







BIRDSBORO
STEEL FOUNDRY & MACHINE CO.
Birdsboro, Penna.

HYDRAULIC PRESSES

Designers and Builders of:
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Crushing Machinery • Rolls • Steel Mill Machinery

BRANCH OFFICE: Pittsburgh, Pa.

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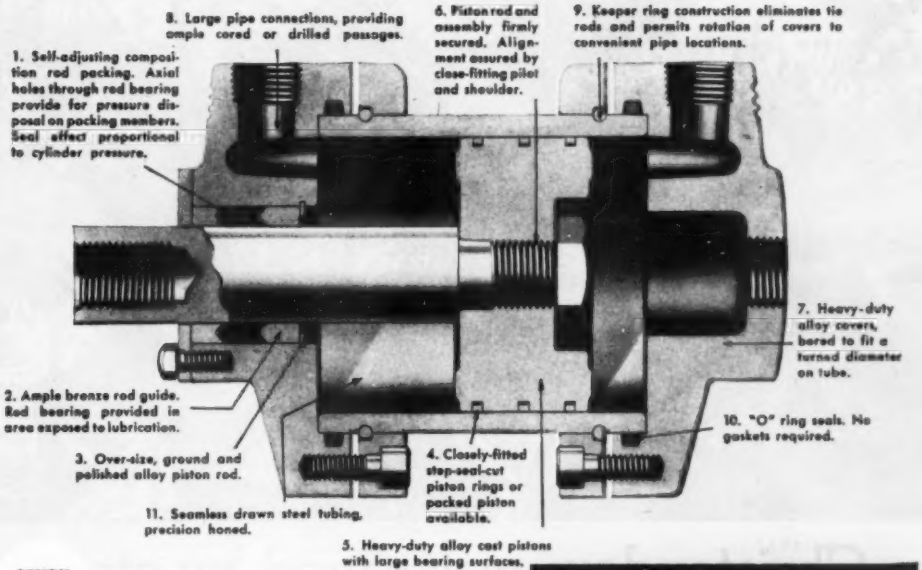
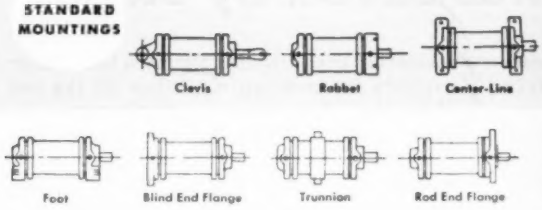
HP-7-51

More Power to You


8. Large pipe connections, providing ample cored or drilled passages.
6. Piston rod and assembly firmly secured. Alignment assured by close-fitting pilot and shoulder.
9. Keeper ring construction eliminates tie rods and permits rotation of covers to convenient pipe locations.
1. Self-adjusting composition rod packing. Axial holes through rod bearing provide for pressure disposal on packing members. Seal effect proportional to cylinder pressure.
7. Heavy-duty alloy covers, bored to fit a turned diameter on tube.
2. Ample bronze rod guide. Rod bearing provided in area exposed to lubrication.
10. "O" ring seals. No gaskets required.
3. Over-size, ground and polished alloy piston rod.
4. Closely-fitted step-seal-cut piston rings or packed piston available.
11. Seamless drawn steel tubing, precision honed.
5. Heavy-duty alloy cast pistons with large bearing surfaces.

SEVEN STANDARD MOUNTINGS



..with RIVETT HYDRAULIC CYLINDERS

You'll find the performance of Rivett hydraulic cylinders close to foolproof. Designed with the utmost simplicity, they have no tie rods — keeper ring design permits covers to be rotated to convenient pipe connections and installation made in a minimum of space. External "O" rings are used as static seals to eliminate gaskets and assure leakproof operation. Sealing efficiency improves with increased pressure. Closely fitted automotive type piston rings reduce friction to a minimum.

Available in three pressure ranges: to 300 P.S.I. maximum and 1500 P.S.I. maximum service with standard models. 3000 P.S.I. maximum and higher services furnished on application. Seven standard mountings, in 10 bore diameters, in any stroke up to 96", with standard size or 2:1 over-size piston rods, cushioned rod end, blind end or both. Special covers supplied. Send for Catalog Section 104.

RIVETT LATHE & GRINDER, Inc.
DEPT. AM-2 BRIGHTON 35, BOSTON, MASSACHUSETTS

RIVETT furnishes a complete power package

VALVES • CYLINDERS • POWER UNITS

Air and Hydraulic
All sizes and types

Christendom was saved by steel

ALL day long, waves of Arab horsemen beat upon the ranks of Charles Martel's veteran militia. But time after time, the enemy cavalry recoiled before storms of iron-tipped javelins, their shining scimitars unsuccessful. On the second morning, the Saracen leader, Abderrahman, was slain, pierced with many spears. The Moslem horde fled back across the Pyrenees, never again to menace the Western world.

Time after time, as at Tours in 732 A.D., Christian civilization has been threatened by seemingly invincible enemies. Yet history proves that victory invariably has gone to the nation or alliance which excelled in the production and use of iron and steel.

In the present era of alarms and crises, it is reassuring to realize that America has greater capacity for making steel than all the rest of the world combined. Furthermore, the American steel industry is expanding at a rate far faster than that of all the dictator-directed economies behind the Iron Curtain. Our free and independent steel making and metal working industries can and will forge sinews for the peace we want or for the war we may be forced to fight.

So remember this: It is not only the threat of Muscovy to fear—America has itself to fear also—its misguided sentimentalists, its sheltered saboteurs—who seem to play communism's game by frittering away our strength and our resources.

QUALITY YOUNGSTOWN SERVICE

The Youngstown Sheet and Tube Company

General Offices--Youngstown 1, Ohio
Export Offices--500 Fifth Avenue, New York

MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

CONDUIT - PIPE AND TUBULAR PRODUCTS - BARS - RODS - COLD FINISHED CARBON AND ALLOY BARS - SHEETS - PLATES - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - TIE PLATES AND SPIKES.

GREATER MACHINE SPEEDS, LONGER TOOL LIFE, LOWER PRODUCTION COSTS

Lusol THE NEW COOLANT

THAT HAS REVOLUTIONIZED PRODUCTION THINKING

10 MILLION GALLONS OF PROOF

The use of 10 million gallons of Lusol solution in exhaustive testing and in everyday plant applications lies behind the extraordinary claims we make for this extraordinary coolant. It has revolutionized the ideas of some of the country's most critical production experts on the subjects of machine speeds, tool life and production costs. These men demanded proof and got it.

SPEEDS INCREASED UP TO 400%

Lusol affords such efficient cooling at the point of tool contact that it has made possible up to 300% to 400% greater speeds, and at the same time less tool wear, less tool breakage, finer finish and greatly increased production. One case, for example, a bar of 18.8 stainless steel was being cut in 20 minutes. Lusol was then used. Speeds were increased from 30 RPM to 267 RPM and the bar was cut in 2 minutes. On this job tools had been breaking frequently. After shifting to Lusol, tool breakage has been reduced to zero. This is just one case, but it is typical of the results that make Lusol hard to compete with.

WHY OPERATORS LIKE LUSOL

Lusol offers the operator many advantages. In the first place it is clear and clean, mild as a soap solution, and not irritating to the skin. Clothes and shoes are kept cleaner and the whole shop takes on a new look. It helps keeps the machine clean, and a good operator appreciates this; and, very important, it is a clear solution that allows the operator to see the work as the finest drill comes down to the work piece. This means more perfect vision at the critical point so often blurred by old type coolants. On top of being pleasanter and easier to work with, Lusol means fewer tool changes, less wheel dressing, far greater speeds, and more efficient production.

SAVINGS YOU CAN'T AFFORD TO MISS

If you are machining, milling, boring, broaching, tapping, drilling or grinding, you cannot afford to disregard the savings that Lusol has made possible for others (perhaps your competitors) whose production involves these operations. Look at these figures "275% greater production per broach grind," "Saved 90% drills, 75% taps," "Over 200% more pieces per wheel dressing." These are facts. They are proof of the type of result Lusol is achieving and can achieve for you.

PROOF THROUGH CASE HISTORIES

BROACHING

266% greater production per broach grind

AMERICAN HORIZONTAL BROACH
Metal: Steel forging
Operation: Broach clutch hub. Broach and work ran hot requiring a *shutdown every 2 hours* for cooling when ordinary cutting oil was used. Changed to Lusol and ran 8 hrs. continuously. Tool and work remained cool.
Ordinary Cutting Oil — 2100 pieces per broach grind.
Lusol — 7700 pieces per broach grind.

TAPPING

Tap life increased 1300%

LEES SPECIAL TAPPER
Metal: No. 1008 Steel.
Operation: Tap 3/4" — No. 11 1" through an 11/16" drawn hole at 120 SFPM.
Ordinary Cutting Oil: 30 pieces per tap.
Lusol: 420 pieces per tap.

GRINDING OPERATIONS

Grinding time reduced 25%

LANDIS EXTERNAL GRINDER
Metal: CN Steel.
Operation: Step roll grind to 4 diameters; 1-6" r, 1-9" r, 2 rr. angles removing .015"-.030" of metal.
Ordinary Soluble Oil: Grinding time 8 hours.
Lusol: Grinding time 6 hours.

CASE HISTORIES YOU CAN'T AFFORD TO OVERLOOK

Lusol

SAVES TOOLS ▼ SPEEDS WORK CUTS COST

NATIONAL DISTRIBUTION . . . WAREHOUSE STOCKS

F. E. ANDERSON OIL COMPANY
222 Brownstone Ave., Portland, Conn.

Please send me your case history material on:
☐ Broaching ☐ Drilling, Tapping ☐ Grinding

Name
Company
Address

COPPER AND BRASS
now scheduled
for improved delivery
ON DEFENSE ORDERS

IF YOU need brass or copper to fill a defense order (DO), get in touch with your nearest Chase warehouse. And ask about our deliveries. Mill shipments are favorable. Warehouse shipments are prompt, and in many cases we can make immediate delivery of small "DO" orders right from stock. With our own mills and with 23 Chase warehouses in large industrial cities from coast-to-coast there is no one in a position to give you better service on your brass and copper requirements.

COPPER ROTATING BANDS. We are also in an excellent position to supply copper rotating bands of all sizes, clean and free of burs. Your inquiries are invited.

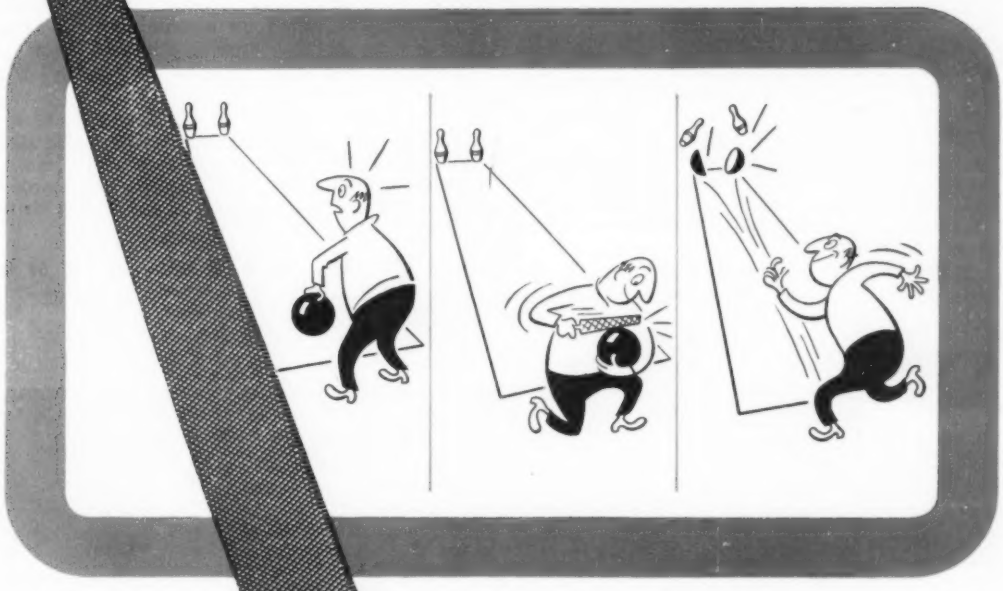
Chase *the Nation's Headquarters for* BRASS & COPPER

WATERBURY 20 CONNECTICUT — SUBSIDIARY OF KENNECOTT COPPER CORPORATION

THIS IS THE CHASE NETWORK . . . *handiest way to buy brass*

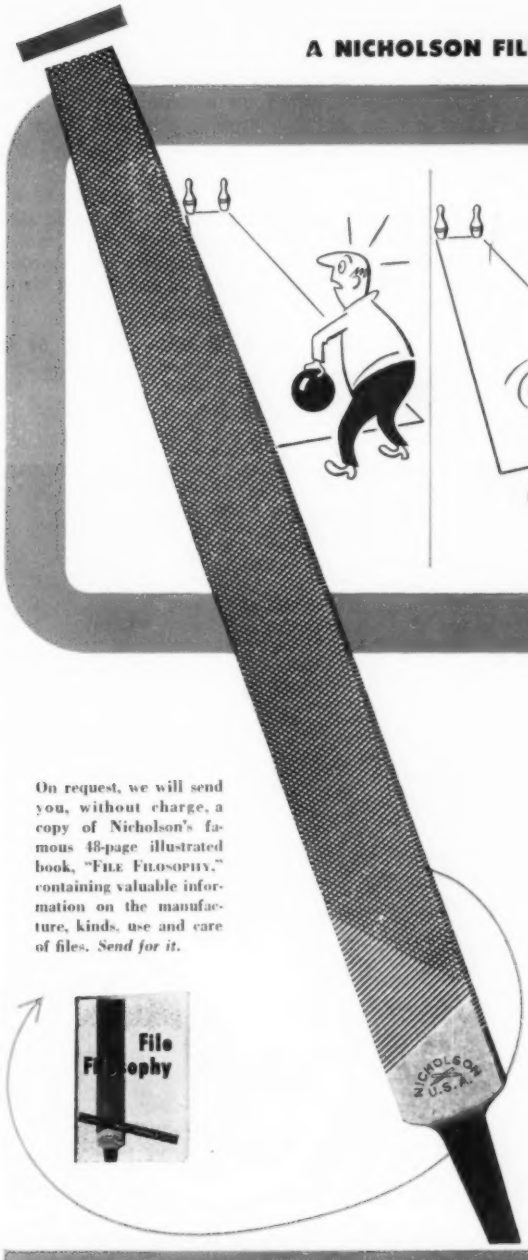
ALBANY† ATLANTA BALTIMORE BOSTON CHICAGO CINCINNATI CLEVELAND DALLAS DENVER† DETROIT HOUSTON† INDIANAPOLIS KANSAS CITY, MO. LOS ANGELES MILWAUKEE MINNEAPOLIS NEWARK NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH PROVIDENCE ROCHESTER† ST. LOUIS SAN FRANCISCO SEATTLE WATERBURY †Sales Office Only

A NICHOLSON FILE FOR EVERY PURPOSE



foremost

On request, we will send you, without charge, a copy of Nicholson's famous 48-page illustrated book, "FILE FILOSOPHY," containing valuable information on the manufacture, kinds, use and care of files. *Send for it.*



Publicity—in any field—does not create leadership . . . it only reflects it. Steady, and generally unusual, advertising over the years has voiced Nicholson's preeminence in the field of files. But only a consistently superior product has actually established it.

Superiority in Nicholson and Black Diamond files is a combination of a number of things: Expert design, high-grade file steel made to our own specifications, evenly surfaced blanks and accurate cut, uniformly correct hardening . . . these are features assured through rigid controls and checks at every stage of production.

Under them it is almost impossible to find a Nicholson or Black Diamond file that cannot live up fully to the Nicholson guarantee of *Twelve perfect files in every dozen.* Yet Nicholson research goes on—seeking constant betterments, bringing out new designs, keeping everlastingly at the job of giving you the absolute best in files in any race competition may set.

From the thousands of available kinds, cuts and sizes, your industrial distributor has Nicholson's aid in helping you select *The right file for the job.*

NICHOLSON
A FILE FOR EVERY PURPOSE

NICHOLSON FILE CO. • 29 ACORN STREET • PROVIDENCE 1, RHODE ISLAND
(In Canada, Port Hope, Ont.)

SOUTH BEND 10" *Precision Lathes*

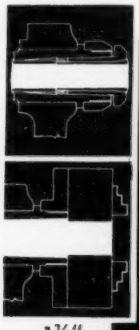
The 10" Swing, 1" Collet Capacity South Bend Precision Lathe is engineered for the most exacting close-tolerance machine work. The direct belt drive to the carefully balanced spindle assembly provides smooth, vibration-free speeds up to 1357 r.p.m. Slow speeds for heavy cuts on large diameters are driven through back-gears. Full quick change gear equipment makes any of 48 different threads and 48 different feeds instantly available.

The precision, speed, and versatility of this lathe assures an efficient output on toolroom or manufacturing jobs. The 1⅜" bore through the headstock spindle makes it especially suited for machining parts from bar or tube stock. A complete line of practical attachments greatly simplifies tooling the lathe for a wide variety of operations.

South Bend Precision Lathes are made with 9", 10", 13", 14½", 16", and 16-24" swings. We also manufacture Turret Lathes with ½" and 1" maximum collet capacity, 14" Precision and Economy Model Drill Presses, and 7" Bench Shapers. Write for complete information today.

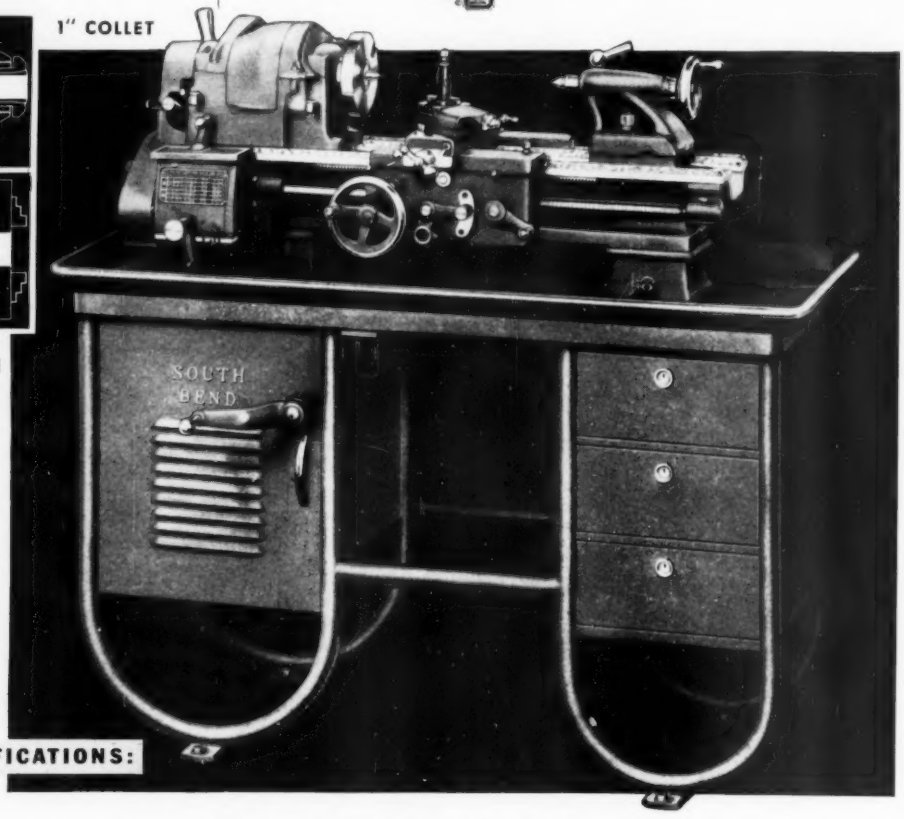
SOUTH BEND LATHE

BUILDING BETTER TOOLS SINCE 1906
SOUTH BEND 22, INDIANA



1" COLLET

1⅜" SPINDLE BORE



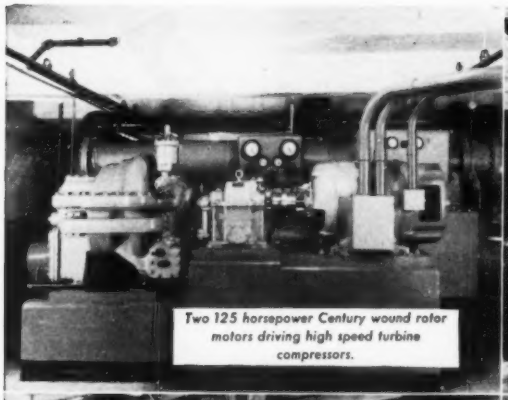
SPECIFICATIONS:

Catalog No. CL187YB South Bend 10"-1" Collet capacity Quick Change Gear Precision Bench Lathe, with 3 foot bed.

SWINGS: 10⅛" over bed and saddle wings, 5¾" over saddle cross slide.
BED LENGTHS . . . 3, 3½, 4 and 4½ feet
CENTER DISTANCE . . 14¾ to 34¾ inches
COLLET CAPACITY . . . . . 1 inch
SPINDLE BORE . . . . . 1⅜ inches

12 SPINDLE SPEEDS . . 50 to 1357 r.p.m.
CROSS SLIDE TRAVEL . . . . . 5⅛"
COMPOUND REST ANGULAR FEED . . . 2"
POWER LONGITUDINAL FEEDS: 48 R.H. or L.H. . . . . .0015" to .0836"
48 POWER CROSS FEEDS: .0006" to .0309"

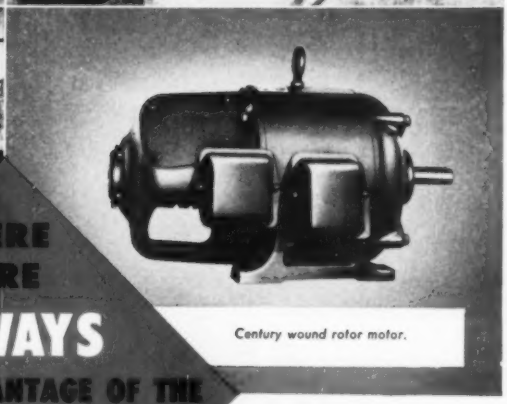
THREAD CUTTING: 48 R.H. or L.H. pitches . . . . . 4—224 per inch
LEAD SCREW . . . . . 29° Acme thread
TAIL STOCK CENTERS . . . 60° No. 2 M.T.
TAIL STOCK SPINDLE TRAVEL . . . . . 2⅛"
MOTOR recommended . . . . . ¾ h.p.



Two 125 horsepower Century wound rotor motors driving high speed turbine compressors.

Century 100 horsepower wound rotor motor driving a refrigeration compressor.

Century 75 and 30 horsepower wound rotor motors driving a bending roll.



Century wound rotor motor.

HERE ARE 4 WAYS TO TAKE ADVANTAGE OF THE FLEXIBLE POWER OF Century WOUND ROTOR MOTORS

Meet Load Characteristics for:

1. *Adjustable varying speeds control variable process and other load conditions.*
2. *Reversing direction of operation of heavy loads — as in lift bridges.*
3. *Syncro-speed, multiple drives used where two or more operations must be coordinated.*
4. *High starting torque with low starting current — such as reciprocating compressors, steel plate bending rolls, etc.*

Century wound rotor motors are built in sizes up to 400 horsepower and are available in open protected and splash proof frames. In addition, Century builds a complete line of AC and DC motors in sizes from 1/6 to 400 horsepower for all popular requirements.

Specify Century motors for all your electric power needs.

Century Electric Company is celebrating its 50th year in the electrical industry.

ALTERNATING CURRENT MOTORS

POLYPHASE
Squirrel Cage Induction— 1/6 to 400 H.P.
Wound Rotor Motors— 1 to 400 H.P.
Synchronous Motors— 20 to 150 H.P.

SINGLE PHASE
Split Phase Induction— 1/6, 1/4, 1/3 H.P.
Capacitor— 1/6 to 20 H.P.
Repulsion Start, Brush Lifting, Induction— 1/2 to 20 H.P.

DIRECT CURRENT MOTORS
1/6 to 300 H.P.

GENERATORS
AC, .63 to 250 KVA
DC, .75 to 200 KW

MOTOR GENERATOR SETS
AC to DC, AC to AC
DC to DC, DC to AC

Open Protected, Splash Proof, Totally Enclosed Fan Cooled, Explosion Proof.

Ball Bearing motors are factory lubricated for several years' normal service. Bearing housing construction permits easy re-lubrication when unusual service demands it.

CENTURY ELECTRIC COMPANY
1806 Pine St. • St. Louis 3, Missouri
Offices and Stock Points in Principal Cities

Century C MOTORS

TAFT-PEIRCE *Introduces*

a grinding spindle with ball raceways ground directly into the shaft

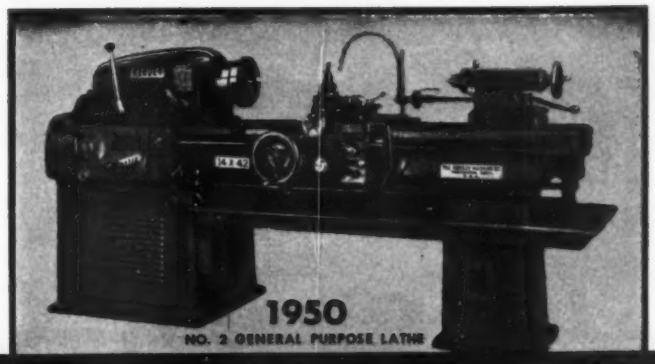
Made of toughened steel, hardened and ground all over. Driven by ¾ H.P., 3600 r.p.m. motor. Quill 3" in dia.; nose taper 3"; ft.; length over-all 22⅛". Entire unit sealed and lubricated for life.

- ★ Handles far heavier loads
- ★ Gives the ultimate in precision and finish
- ★ Ensures minimum chatter
- ★ Ensures concentricity of wheel mounting with axis of rotation

Ball raceways of this new spindle, ground directly into the shaft, carry both annular and axial thrust. Virtually eliminated is run-out of wheel mounting thimble, a fault frequently encountered in spindles with built-up bearing assemblies. Furthermore, because of this new feature, the spindle construction is far stronger and heavier.

Designed to provide maximum precision in Taft-Peirce Surface Grinders, this new spindle is also adaptable to wide use on other surface grinders, machine tools, and special applications. Write today for further information to the Taft-Peirce Manufacturing Company, Woonsocket, R. I.

T-P means TOP PRECISION

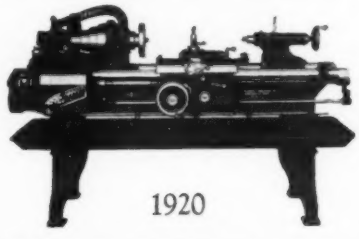


. . . If you are not using Modern Hendey Machines you are not earning the profits that you should!

THE HENDEY MACHINE CO.
HARDENED AND GROUND BED WAYS

The new Hendey No. 2 General Purpose Lathe is the ultra-modern successor of the famous Hendey Cone Head Lathe and was designed especially to perform tool room work with the greatest ease—at the greatest profit. A single lever instantly shifts the belt to any of the eight spindle speeds. There is an independent motor in the base and a unique design feature that completely eliminates belt pull on the spindle. The operator has a choice of 48 thread and speed changes. Both the carriage and tailstock ways are induction hardened and precision ground. Other *plus* features include cam lock or long taper key drive spindle noses—preloaded, super-precision spindle bearings—automatic lubrication—a swing of 16" and a wide choice of bed lengths.

This is truly a modern lathe to meet modern tool room requirements. Write for catalog.



Thousands of these old Hendey Cone Head Lathes are still in use throughout the world. Compare their performance against the new No. 2 General Purpose. The old Cone Head has overhead, manual belt shifting. Belt pull is direct on spindle from countershaft drive or motor on bracket. Top speed is 465 R.P.M. Bed is hand scraped, soft cast iron. A wonderful machine in its day, but not adequate for today's needs. How many of these in your shop? . . . losing money!

Continuous, advanced engineering by Hendey is worth watching—and must be watched if you are to earn full profits from your lathes and shapers. For complete particulars and prices, contact your nearest Hendey office.

MODERN Hendey

THE HENDEY MACHINE COMPANY
MAIN OFFICE & PLANT: TORRINGTON, CONN.
BRANCH OFFICES: New York, Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco
REPRESENTATIVES: Philadelphia, Cleveland, Pittsburgh

PROTECTED BY Parco Compound PARKER RUST PROOF CO QUALITY RUST RESISTANT

TOUGH, TOO

Parco Compound's

matte black finish provides superior rust resistance

When iron and steel products are subjected to rugged use or exposure, corrosion impairs efficiency and spoils appearance. Parco Compound resists corrosion, prolongs service life and looks.

From simple nuts and bolts to complex cast machinery parts, Parco Compound provides economical rust resistance—and, combined with a Parcolac, assures good appearance in stock and good performance in actual use.

Parco Compound does not materially change the dimensions of the product treated—of prime importance in machined or threaded articles—and it reaches holes and recesses for *complete protection.* Any iron or steel part which can be immersed in the tank can be treated with Parco Compound.

Parco Compound has been the standard rust resistant finish for iron and steel for 35 years. Learn what Parco Compound can do for *your* product. Write today for full information.

Parco Compound meets U.S. Government finish specifications JAN-L-548 and U.S.A. 57-0-2, Type II, Class B. Write for information regarding other specifications.

Bonderite, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

PARKER

PARKER RUST PROOF COMPANY
2196 East Milwaukee Ave.
Detroit 11, Michigan

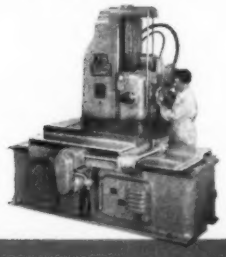
BONDERITE—Corrosion Resistant Paint Base • PARCO COMPOUND—Rust Resistant • PARCO LUBRITE—Wear Resistant for Friction Surfaces

THE "JIGMIL TECHNIQUE"

OBSOLETES JIGS

for Precision Boring Operations on Small Lot Production

TYPICAL JOB TAKEN FROM OUR JIGMIL CASE HISTORY FILE



PART • Cast-Iron Gearbox.
OPERATION • Bore and Counterbore 13 Holes Ranging from 1.8505" to 2.8335". Face Two 3½" Diameter Bosses.

FLOOR TO FLOOR TIME • 75 Minutes.
TOLERANCE ON HOLE SPACING • .0005".
TOLERANCE ON BORE DIAMETERS • .0004".

"Come to Detroit and investigate the Jigmil Technique"

Demonstrations at our Plant by appointment.

DEVLIEG MACHINE CO. DEVLIEG JIGMIL 450 FAIR AVE. FERNDALE 20 (DETROIT) MICH.

Send for illustrated Jigmil Catalog

FIGHT WASTE

IN PEACE WASTE IS A SIN...
NOW...WASTE IS A CRIME!

DISSTON
Announces a New
WASTE PREVENTION PLAN
for increasing productive efficiency

In the face of growing shortages of tools, materials, and manpower, American industry is daily receiving new demands for higher and still higher production . . .

NOW COMES THIS NEW DISSTON PLAN TO HELP YOU GET MORE OUT OF YOUR TOOLS, MATERIALS, AND MANPOWER—TO HELP YOU INCREASE PRODUCTION, CUT MANUFACTURING COSTS—BY STOPPING WASTE!

DISSTON GIVES YOU THE PLAN READY TO USE!

The foundation of this "Fight Waste" program lies in educating workers to use tools properly. For this purpose, Disston will supply you—without cost or obligation—with individual instruction cards containing specific facts on the most efficient use and care of the cutting tools listed below. Use of these cards simplifies and multiplies supervision, speeds training of new and unskilled men, helps make the most productive use of time, effort, and equipment! You also get complete instructions on how to distribute the cards in your plant.

ORDER THESE CARDS IN ANY QUANTITIES:

No. 1 *Power Hack Saw Blades*
No. 2 *Hand Hack Saw Blades*
No. 3 *Milling Saws*—Circular High Temper
No. 4 *Fast Running Metal Saws*—Circular—Medium and Mild Temper
No. 5 *Carboloy Saws*
No. 6 *Carboloy Knives, Cutters, Etc.*
No. 7 *Flexible Back Metal Band Saws*
No. 8 *Inserted Tooth Circular Metal Saws*
No. 9 *General Information on Files*
No. 10 *Saw Files*
No. 11 *Machinists' Files*
No. 12 *Special Purpose and Wood Working Files*
No. 13 *Superfine Swiss Pattern Files*
No. 14 *"Rights and Wrongs"* in Refitting Circular Saws
No. 15 *Wide Band Saws—Log Mill Saws*
No. 16 *Narrow Wood Cutting Band Saws*
No. 17 *Dado Cutters*
No. 18 *Solid Tooth Circular Wood Cutting Saws*—Flat Ground—Rip and Cross-Cut
No. 19 *Circular Wood Cutting Combination Saws*—Hollow Ground—Raker Tooth Type
No. 20 *Circular Wood Cutting Combination Saw*—Flat Ground—Raker Tooth Type
No. 21 *Solid Tooth Circular Edger Saws*
No. 22 *Solid Tooth Circular Trimmer Saws*—Flat Ground
No. 23 *Narrow Band Saws for Cutting Plastics*
No. 24 *Solid Tooth Circular Plastic Saws*—Hollow Ground
No. 25 *Circular Knives*
No. 26 *Paper Knives*
No. 27 *Thin Planer Knives*
No. 28 *Heavy Planer Knives*
No. 29 *Veneer Knives—Rotary and Slicer*
No. 30 *Chipper Knives*
No. 31 *Cutter Heads*—Circular, Generated and Straight Knife Types

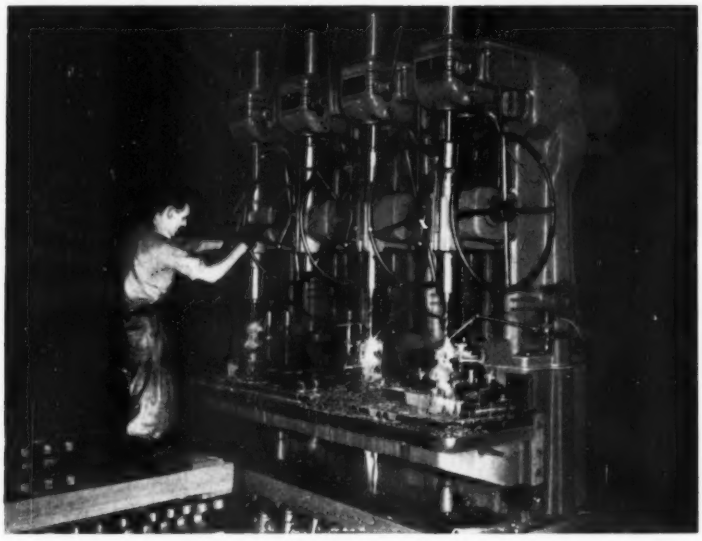
ALSO: "The Pocket Foreman"—a complete manual for the use of foremen and other supervisory workers on how to FIGHT WASTE in their departments—how to boost the productivity of their men. Contains a complete set of "Fight Waste" Cards as a guide in ordering.

GET COMPLETE DETAILS

Your Disston distributor will gladly give you information on applying this plan in your plant—help you determine your needs for "Fight Waste" material. Consult him or write Disston direct.

HENRY DISSTON & SONS, INC. 220 TACONY, PHILADELPHIA 35, PA., U.S.A.

Higher *Production* Lower *Costs*



Fifty-three minutes are saved in the time for drilling on **each** of the brake tongs that are being manufactured at the Red Lion plant of The Budd Company. The brake tong is a part of the disc brake assembly, and involves 1-1 8", 1-1 16" and 1-7 16" diameter drilling in tough steel. These parts are produced in sufficient quantities to warrant the use of the simplified production type four-spindle gang drill. Each unit of this machine is powered by a 7½ HP driving motor, and one operator can keep all four units performing at peak capacity.

If your work includes mass production drilling, this is the type of machine you will want to know about. Its husky design and many features for convenient, fast and dependable operation, will interest you. Single units as well as gang drills are available in 21", 24" and 28" sizes, and with 3, 5, 7½ or 10 HP motors. These powerful DIRECT DRIVE Super Service machines are especially adapted to utilize drill heads.

Investigate the time saving possibilities by writing today for Booklet U-27.

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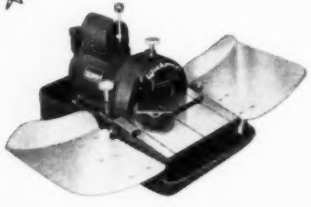

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With 1 HP reversible motor and impeller-type 12 gph coolant pump, this heavy bench grinder delivers fast, economical grinding with both silicon carbide abrasive wheels and Wickman steel-bonded diamond wheels. Wheel guards and splash protectors, three position table for wheel wear adjustment, plus a protractor slot for angular grinding, make this the ideal grinder for all off-hand grinding around the shop.

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Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Cold Coolant

We recently received inquiries regarding an article which appeared in a post-war issue of "American Machinist" and which referred to the development of a cutting oil that can be used in a temperature range of -40° to -100°C.

If you can identify the article from the above information, we would greatly appreciate your letting us know in which issue of your publication it appeared.

F. Reich, Manager
Lubricating Department
California Texas Oil Company Limited, New York, N. Y.

Probably the article is one entitled "Silicones . . . What They Are and What They Do," which appeared in our Nov. 18, 1948 issue. Written by William T. Eveleth, chemical dept., General Electric Co., this article contains one section devoted to silicone oils. One of the outstanding characteristics of these oils is their ability to function at extremes of temperature. No specific mention is made of their use as cutting oils. However, several examples of their performance as damping oils, hydraulic oils, and as lubricants are given. One successful application is in a small dc aircraft motor which requires positive starting at –85 F.

As silicone oils are capable of such performances, they also may have been applied as cutting oils since publication of the original article. The use of refrigerated coolant is increasing, particularly on operations such as grinding and honing. Occasionally, too, we hear of machining with liquid CO, to hold the work at low temperatures. Possibly, silicones, with small change in viscosity at low temperature, could be used on work of this kind. If anyone has tried silicones, on such jobs, we would be interested in hearing about it.—Ed.

Swaging Bands on 20-mm Shells

Referring to your inquiry on the banding of 20-mm shells, we wish to advise that our swaging equipment was widely used during the second World War for attaching the copper rotating band to various sizes of ammunition. For the 20-mm shells, our No. 3A Swaging Machine with special Airdraulic Feed was offered to the trade as a 3A Shell Bander. We are enclosing descriptive literature of this machine.

A. T. Scattergood
The Fenn Manufacturing Co.
Hartford, Conn.

According to the literature, swaging is the fastest known method of banding the 20-mm shell and at the same time results in a material saving of about 17% as the width of the band can be reduced over that required for press attachment. Furthermore, there are no indentures on the outside of the band. Although some contractors averaged close to 500 shells per hour, 350 pieces per 50-minute hour can be taken as a fair basis upon which to figure production. The actual time for attaching is about 1½ seconds, so floor-to-floor production time depends upon the facilities for carrying the shells to and from the machine as well as the dexterity of the operator. It is interesting to note that those contractors who used female operators turned in the consistently higher production. — Ed.

Head Beats Hands

Al is right about the peculiar abilities of an intelligent lazy man (*AM*, Sept. 18, 1950, p.126), and the outstanding case in my own experience was the building of some hundreds of shell-making machines for 8- to 12-in. shells during World War I, by Amalgamated Machinery Corp. 35 years ago.

These machines weighed ten tons each, and their design, methods of manufacture, and the assembly-shop facilities provided, were described and illustrated by Ethan Viall (*AM*, Vol. XLIV, 1916, p. 793-800).

THE INDUSTRIAL CYCLE

IMPROVED QUALITY
GREATER PRODUCTION

REDUCED COSTS
HIGHER WAGES TO WORKERS

GREATER MARKETS
GREATER PURCHASING POWER

COMPETITION
GREATER DEMAND

IMPROVED DESIGN
IMPROVED METHODS & EQUIPMENT

We are living in an industrialized world. Our ancestors worked much harder and longer hours than we do yet they could produce only the bare necessities of life. We, because of the tools we have to work with, can produce the equivalent of not only all the necessities of life but many luxuries as well.

New machine tools that increase the productivity of the worker enables the manufacturer to Reduce Costs and pay Higher Wages to Workers. Higher Wages creates Greater Purchasing Power and Greater Markets. This means Greater Demand for goods and encourages Competition.

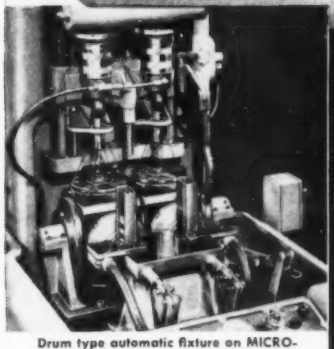
To meet this Competition the manufacturer must adopt Improved Methods and Equipment to get Improved Quality in his product and Greater Production. Greater Production means Reduced Costs and we start the cycle again.

Only by keeping this cycle in balance and in motion can we hope to keep our standard of living at its present high level. Only by increasing man's productivity by providing him with better, more productive tools can we keep our Industrial Cycle spinning.

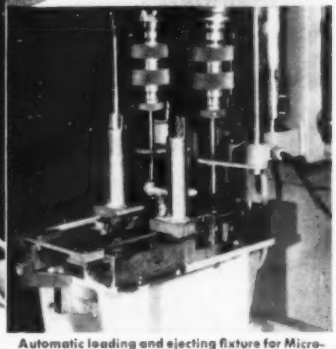
MICROSIZE*, automatic size control, is one of the contributions **MICROMATIC*** has made to modern tooling. **MICROSIZE** has made possible automatic and semi-automatic Microhoning* machines. It has Improved Quality and Reduced Costs by holding dimensional tolerances more consistently and reducing inspection and scrap. It has increased the productivity of the worker many fold.

Do not let obsolete methods and machine tools slow down your cycle.

*Registered U. S. Patent Office



Drum type automatic fixture on MICROSIZE controlled Microhoning machine.



Automatic loading and ejecting fixture for Microhoning gears on double spindle Microhoning machine, made possible by MICROSIZE control.

Write for latest issue of Cross Hatch on the Industrial Cycle.

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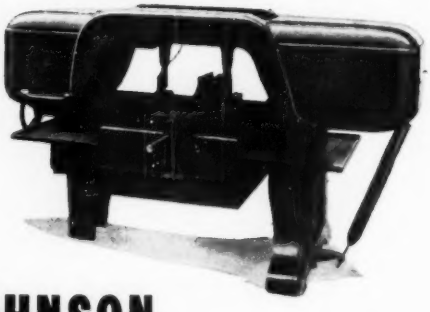

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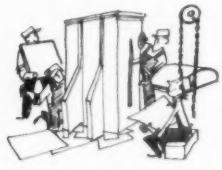
These superior saws stay on the job year after year, giving trouble-free service, because they're made right, from the best standard parts obtainable. They are the product of a long established, thoroughly experienced Company with a reputation for offering top values in modern metal-cutting equipment. For greater capacity, speed and efficiency, be sure to choose a Johnson Saw. Model J, pictured, 10" x 18" capacity, Model B, 5" x 10" capacity. Write for catalog today.

JOHNSON MANUFACTURING CORP.
ALBION, MICHIGAN

Each machine was started in the morning and shipped the same night and was built by a crew of four men at a piece price of $40, the day rate of machinists then being 50c per hour.

No frame castings were ever ahead and those required for each day's production were received during the night, and brought into the shop before seven in the morning, so when a machine was finished another could not be started until the next day and the crews went home as soon as their machines were finished. It took about ten men 92 consecutive hours to build the first machine, but after a few days the average per machine was less than the 40 hr estimated.



Before the start, we considered picking a working supervisor to direct the work of each crew but decided to tell them they were not to have any supervision other than that of the superintendent. Within a week the strongest character in each group had asserted his leadership and the gangs were being referred to as Martin's gang, Hobart's gang, etc.

Only one gang never had a leader and they were probably the most highly skilled men in the place, experienced toolmakers, and all were Swedish. I think they never got through in less than 12 hr and sometimes worked as long as 15 hr on a machine.

The fastest gang in the shop I will call Tobin's gang, and their fastest record was 6 hr 20 min. Only three men did all the work in that gang, because Tobin was the laziest man in the shop and he did no assembling at all but spent all of his time directing the work of the other three so effectively that there was no lost motion at all in their performance. He had been a railroad-shop machinist and knew all of the short cuts that saved effort. In the years that have passed, we have often spoken of him and all agree that we never saw him even tighten a nut. I should add that his gang were the most satisfied men in the place and took great pride in being in his gang.

Lucien I. Yeomans
Chicago

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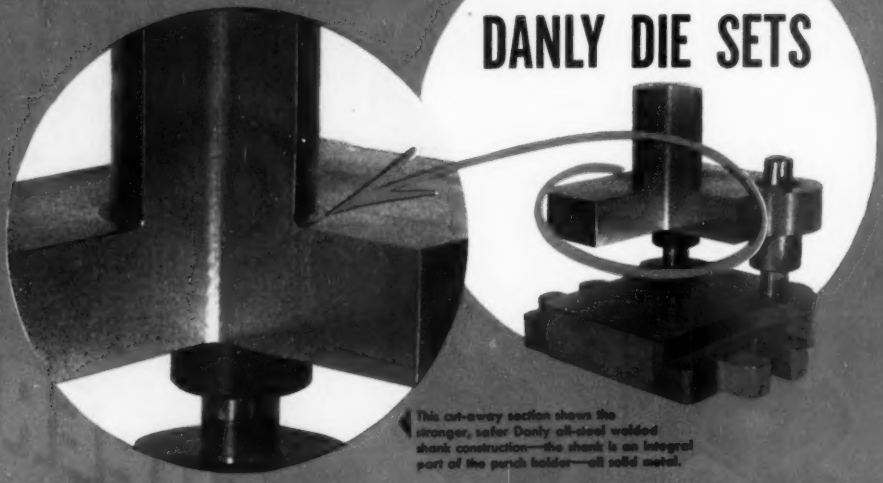
This quality feature is STANDARD construction on all-steel shank type

DANLY DIE SETS



This cut-away section shows the stronger, safer Danly all-steel welded shank construction—the shank is an integral part of the punch holder—all solid metal.

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A new welding technique that assures 100% fusion of shank to punch holder makes this superior construction possible. Knock out holes in the shank itself or machining on the punch holder face are much less likely to effect shank strength.

Features like this make Danly the nation's leading die set producer. Check these other Danly Die Set advantages and you'll see why die makers and production men everywhere prefer Danly Die Sets:

- *prompt delivery* . . . from the nearest of the nation wide system of Danly assembly branches.
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- *broad selection* . . . the wide range of Danly standard and stocked special die sets meets nearly every tooling need.
- *Danly reliability* . . . every Danly Die Set is backed by the experience accumulated in more than a quarter century of service to the stamping industry.

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DANLY®

SPOT NEWS of Metalworking

- **Philadelphia Navy Yard and Picatinny (N. J.) Arsenal** of Army's Ordnance Corps are being run on a "break-even-or-else" basis. Defense Department planners allocated lump sums to them and cut them off from government bookkeeping and purchasing channels. Both are operated just as private corporations are, with accounting of funds at end of year. The plan, called the "working capital concept," will be extended to other operations if it succeeds.

- **Machinery Branch of Office of Price Stabilization,** when finally set up, will have following sections: Machine tools, Electric generating and power equipment, Processing machinery, Transportation equipment, Machine parts and subassemblies, Cutting tools and industrial supplies, General and auxiliary machines, Economic and analysis. Machinery Branch will be part of OPS's Machinery and Manufactured Goods Division. Other branches will be Mechanical Building Materials Branch and Automotive Branch.

Wage increase of 5-6 cents an hour is in prospect March 1 for 1 million workers covered by General Motors-type cost-of-living wage formula. Wage freeze will be thawed enough by then to permit the increase to take effect, Washington believes.

- **Machine tool orders rose in December to 410.1** on the index of National Machine Tool Builders' Association. That was sharp jump from 291.9 in November. Previous postwar high was 305.1 last August. Foreign orders showed up as 112.8 on the index. For details on Machine Tools, see page 111.

- **Tin-zinc deposits are being used as substitute protective coating for cadmium,** which has become very scarce.

- **Gear teeth are being shaved up to diameters of 48 in. economically.** Gears are cut green, then hardened to extreme machinability range, and finish shaved. Some shaved gears can be run at pitch-line speeds up to 40,000 fpm.

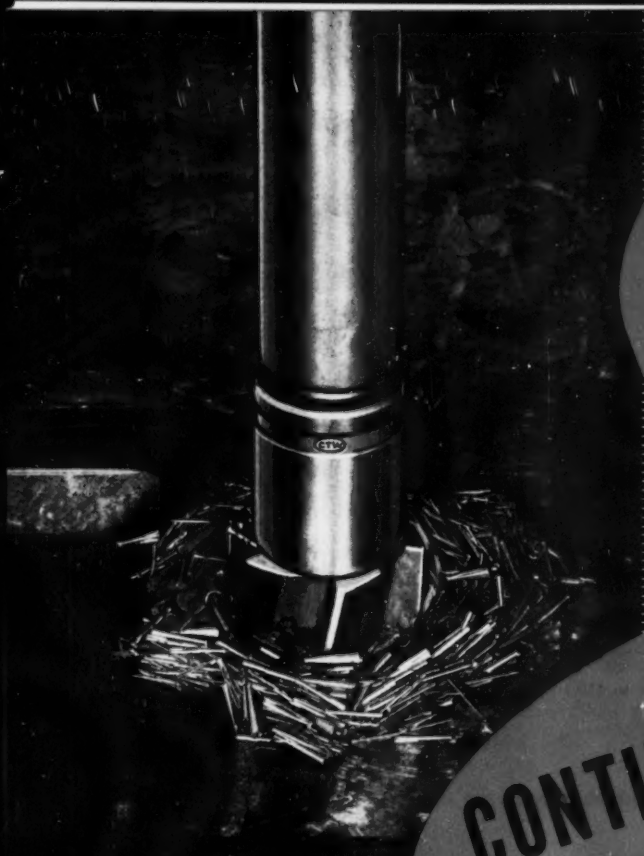
- **Westinghouse claims development of world's most powerful jet engine — the J40 — for the Navy,** as successor to J34 which powers the F2H Banshee fighter. New engine weighs less than 3000 lb., develops thrust equivalent to 14,000 hp for a "bare" engine without afterburner to reheat exhaust gases. Air intake is divided into two elliptical openings arranged like the letter Y. Major engine and aircraft accessories are mounted between arms of Y, minor accessories are strung along sides of engine barrel.

New type of tank will be made by Food Machinery & Chemical Corp. for Army Ordnance Corps which has awarded contract for $177.5 million for the job. Tooling at company's San Jose, Calif., plant will cost $42 million. Other of company's plants will share in the work.

- **First decision of criminal contempt of court order enforcing decision** of National Labor Relations Board has been handed down by U. S. Circuit Court of Appeals at Philadelphia. Officers of Star Metal Mfg. Co. were fined $1,000 for delaying several months the formal signing of contract with AFL Office Workers' Union. Officers pleaded extenuating circumstances, including a strike.

- **Korean war has proved that automatic infantry weapons** are best way to meet threat of lightly-armed guerrillas. It means orders for submachine guns and other portable automatics.

- **Cleveland metalworking companies complain about tendency of USES** to post in employment ads rates which are higher than prevailing rates. Example: tool maker is advertised for at $1.80. Current rate is $1.75. When prospect applies, he finds $1.80 job filled. Instead of taking $1.75 position, he sits and waits for next $1.80 job.



Above: Counterboring a hole in a cast iron machine base. Uniformity of chips indicates free-cutting action; chip disposal is aided by wide flutes. And when the operation is finished the cutter is removed from the holder with a simple twist of the wrist.

HAND DETACHABLE EVEN AFTER THE TOUGHEST CUTS

CONTINENTAL STANDARD DRIVE COUNTERBORES

CTW

There's no wedging action in Continental Standard Drive Counterbores. Cutters are removable from the holder with a simple *twist of the wrist*, even after the toughest cuts. Double driving lugs on the cutters engage double abutments in the holders to give a balanced, positive drive that practically is indestructible. Double bearing areas in the drive assure rigidity and proper alignment of cutters and holders. Continental Counterbores are available individually or in sets that include holders, cutters, countersinks and pilots in practical size ranges.

The new Continental Catalog lists various counterbore holders and cutters (in high speed steel and carbide tipped). For your free copy, write on your company letterhead. Please ask for Catalog No. 60681.

CONTINENTAL TOOL WORKS

Division of Ex-Cell-O Corporation

DETROIT 32, MICHIGAN

30-30

Washington

Defense's $87-billion arms program is an off-hand look at the total volume of contracts — for all hard and soft goods — the Pentagon hopes to let in the next 18 months. It has nothing to do with the rate of production — and deliveries — expected of industry.

Included are procurement plans under the next $10-billion supplemental, most of this year's arms aid, all of next year's, the remainder of this year's U.S. defense appropriations, plus all of 1952's.

The program is approximate and temporary at best. There is still no long-range strategic concept.

• • •

Budget estimates of actual spending are in even worse shape. The fighting side of mobilization consists of roughly rounded estimates for this year and next.

Bets are the $20 billion figure for 1951 is $1 billion too high, at least. There is admittedly no basis of fact for the $40 billion requested for 1952 military spending.

A conservative estimate is that it's too high by at least $5 billion. In many cases industrial delivery schedules concerned haven't even been set.

No detailed breakdown is expected before late spring. Congress won't approve the budget before summer.

• • •

Congress doesn't believe the $16 billion in new taxes Mr. Truman wants is necessary. Fiscal 1952 spending for all purpose is planned at $71.5 billion; it includes most of the Fair Deal, as well as more than $7 billion in foreign aid.

A revenue estimate with present taxes of $55 billion is considered low. A charge of deliberate padding is heard.

There's a good chance that new taxes required to put defense on a pay-as-you-go basis in 1952 will amount to less than $10 billion, even with some price increases.

Congress will wait until the last minute before adding new taxes. It wants to give last year's increases a chance to show what they can do. Odds are that when the new tax bill is passed it will not be retroactive to January 1.

• • •

Over-use of "DO" ratings — perhaps justified — is making them worthless. Most military contracts carry them; they've recently been extended to air transport, and Defense Power Administration wants the same privilege.

Graduated priorities and a Controlled Materials Plan will replace DO's. CMP is being pushed hard.

• • •

A committee of North Atlantic Treaty Organization members meets in Paris this month to set up Gen. Eisenhower's SHAPE headquarters (Supreme Headquarters Allied Powers Europe). U.S. service personnel already have their orders to join SHAPE's staff.

Western Europe is self-sufficient in automotive capacity even with the needs of mobilization, or at least so a NATO task force reports.

It will have to rely on North American industry — U.S. and Canada — however, for much of its requirements in electronic gear, aircraft, and heavy weapons.

• • •

Canada, which has a $300-million arms aid program of its own, plans to spend most of that money at home. Weapons purchased go free to Europe.

• • •

A notable lack of confidence in Truman is developing on Capitol Hill among Democrats as well as Republicans. Some way is sought to keep tabs on his conduct of mobilization and foreign affairs.

• • •

Yugoslavia's Tito has refused U.S. and British offers of direct arms aid. He figures he can beat off even a combined attack by his four unfriendly neighbors if Russia doesn't intervene directly. Acceptance of free western arms might provoke this.

In six months Roumania, Bulgaria, and Hungary have mobilized 200,000 troops, bringing the combined threat to Yugoslavia (including 50,000 Albanians) to 730,000. Tito has 400,000 regulars, plus 1 million trained reserves.

• • •

NATO countries are screening their allowable Iron Curtain exports with an eye to tightening up.

It means a lengthening of Commerce Dept's list of controlled (and banned) exports.

• • •

Red China's turn-about on the West's cease-fire offer caught the State Department off-guard. Officials a few day earlier answered Congress' complaints with assurances it would be turned down flat.

• • •

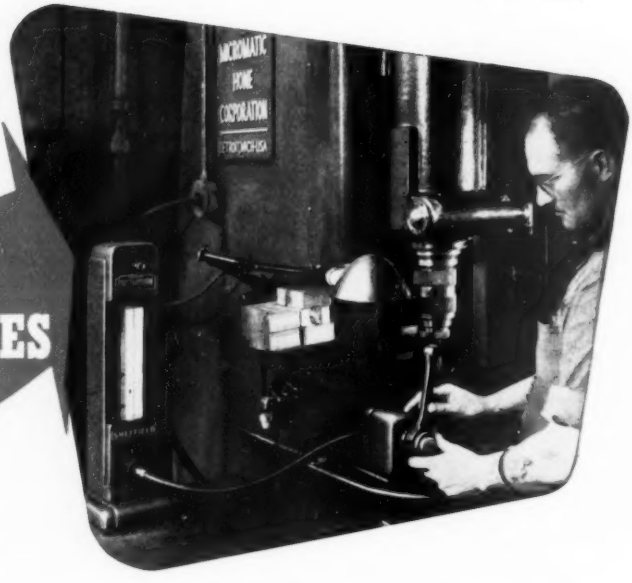
There's still no indication of a time-table to schedule the coming of manpower controls. They'll be held off as long as possible. Any implementation will be step-by-step and gradual. Voluntary controls may be tried first.

Controls when they do come will include firing, hiring, and quitting. Employers and employees will both be controlled. A 48-hour week is probably tops, and present overtime rules aren't likely to be altered.

Eric Johnson has said that wage controls can't be divorced from price controls. Cost-of-living index will be the criterion for general increases. Exceptions and individual raises will be knotted up in red tape. Government paper work for the businessman is approaching World War II limits, may well exceed them.

Management Gratified with Higher Quality and Lower Costs

Resulting from use of SHEFFIELD PRECISIONAIRES



Today's Hydra-Glide Motorcycles represent the best values ever offered by Harley-Davidson Motor Co., Milwaukee. They are the result of gaging and manufacturing methods which earned special grateful acknowledgment from top management to Inspection and Production personnel for higher quality at substantial cost savings.

The combined use of statistical quality control and Sheffield Precisionaires at the machines has eliminated selective assembly and final bench inspection at Harley-Davidson.

Savings are most worthwhile, including reduced work-in-process inventory and lower cost of storage and material handling.

Precisionaires, also, have helped operators get improved performance from their machines—fewer rejects, more acceptable parts.

"Scrap and costly rework have been practically eliminated wherever we have installed Precisionaires", say Harley-Davidson key manufacturing executives.

Precisionaires are used on connecting rod, piston pin, cylinder, tappet guide and all transmission gear bores.

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GAGES • MEASURING INSTRUMENTS • MACHINE TOOLS • CONTRACT SERVICES • THREADING TOOLS

Detroit

Come headaches as they will, automobile production goes rolling along. Washington expected that aluminum and copper limitation orders would tie a halter on car output in a hurry. They didn't. It looks now as though the first 1951 quarter will equal that of 1950—when, however, Chrysler was tied up two-thirds of the time on strike.

If schedules pan out as now constituted, the first three months of 1951 will see produced around 1,750,000 cars and trucks. In getting out that many assemblies, though, some gurgling will be heard in the supply pipelines. They will loosen up. The aluminum and copper orders —particularly the latter—will begin to be felt.

When that comes along, the industry's bite into steel will naturally shorten. This has been the end-aim of Washington. But as Detroit sees it, Washington's ideas on that score have been groundless.

A large share of sheet steel requirements of car makers (which is about three-fourth of the total steel requirement) has lately been coming from conversion deals—steel that otherwise might not have been rolled. When it is figured that some authorities estimate that more than three tons of every ten of sheet and strip are conversion tons, the tonnage of steel that would not ordinarily have been made is evident. And, too, so is the fact that the industry's draw on the mills is not as great as the production statistics would indicate.

• • •

What about that second quarter—specifically? No one in Detroit knows. Auto companies have lately been putting together figures to submit to Washington on their projections for the first half. They aren't yet available, but the latrine talk is that there are wide variances from company to company.

• • •

Despite expectations of production drops as the year goes on, autodom is preparing for 1952 in rather normal fashion. Much tooling is out (enough so that at recent Washington meetings, federal officials pointedly inquired whether it would get in the way of military business about to be placed). This tooling was placed early, with the idea of midsummer deliveries. The reason was not for early 1952 model announcements. It was to get out of the way of war programs.

The auto makers will be placing much of those military machine tool orders. During January big military contracts rippled out all over Detroit. Nine-figure awards were hardly uncommon; the commitments were for tanks, other vehicles, engines, aircraft parts, instrumentation, other work.

Many of these jobs were lately being assigned on negotiation rather than bid. They are so big that few producers can hope to handle them. The military knows who has been in closest touch with the particular field involved, and hands out the deal on the basis of general knowledge and experience.

• • •

Buying continues to lengthen out as to term in Detroit. A report as of Dec. 30 from the Purchasing Agents Assn. indicates that 53% of the buyers in the auto capital are extending purchase orders for a period of three months or more. About 30% are buying two months ahead; the rest are buying within one-month terms or did not report. As recently as two months ago, the proportion placing orders for three months or longer was 45%.

• • •

About 200 machine tools are being ordered for the new Olds contract to make high velocity tank guns for medium tanks. These include turning and boring lathes, rifling and honing machines, milling, grinding, and broaching machines. Some heat treat work will also be required on the contract, which will be housed in a new plant now being built at Lansing. This equipment will fabricate the breech ring, breech block and tube; other parts will be subcontracted.

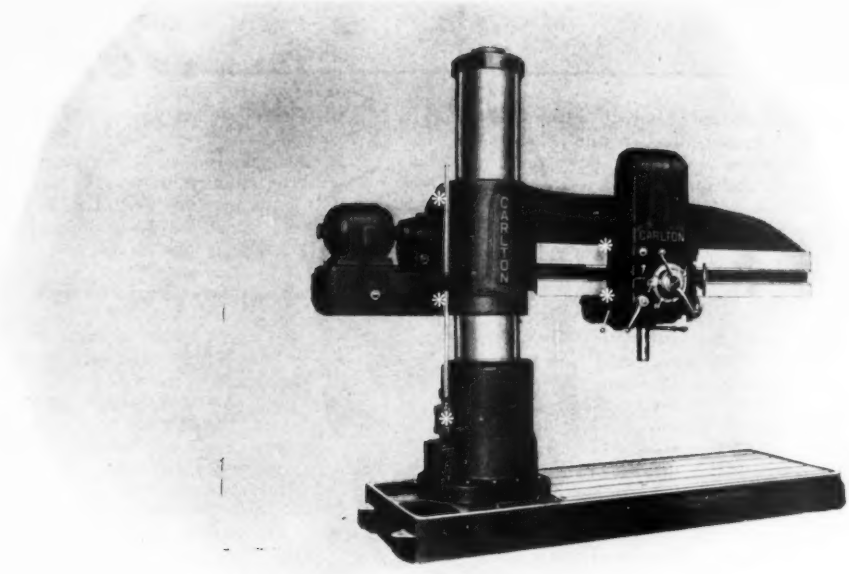
• • •

Washington reluctance to let the auto makers raise prices appeared at the root of a chain of events resulting in wildcat strikes here and there in supplier plants. The chain went like this: Once prices became fixed, purchasing departments were told to turn the heat on vendors. They did. Vendors in turn went to manufacturing departments and demanded more efficiency. Supervisors tightened up on discipline and shop rules. Wildcats followed. At least that's the report currently being heard in Detroit.

For the most part labor is rather quiet these days. The big auto union contracts are closed, and the small ones are following in line. But UAW is hardly satisfied. Here's what it wants in forthcoming agreements: (1) More pensions (to $200 a month basis) and more health and accident insurance; (2) higher vacation pay schedules, ranging up to 160 hours' credit for 15-year men; (3) the annual wage. That latter point, tabbed a major one, would be worked out (if UAW had its way) by a joint labor-management committee.

• • •

Ford has ordered 17 dynamometers from Westinghouse to test engines, transmissions, axles and completed cars and trucks at the new Ford engine test laboratory, Dearborn.



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Carlton radials

***For faster operation, more rigidity, greater accuracy.** Send today for new Power Clamping Bulletin just off the press. Address The Carlton Machine Tool Co., Cincinnati 25, Ohio.

Machine Tools

The machine tool industry is destined to be the first to be geared completely to mobilization needs. The plan has been worked out carefully by National Production Authority in cooperation with the Munitions Board and other government agencies.

Machine tool builders who have civilian orders in process will be permitted to complete them, especially if the machines are well along in the shop and the builder has a considerable investment in them. One of NPA's main aims is to get builders' floors cleared so that nothing will interfere with defense orders. If necessary, NPA will see that builders get materials and component parts to clean up the civilian work in process.

• • •

But the machine tool industry will not be allowed to start new orders for civilian users through their shops. If builders have invested considerable sums in engineering work on orders not yet in the shop, they are just out of luck.

• • •

The upshot will be that the major part of the automotive tooling for 1952 models probably will be completed. Top motor car men are said to have assured General Harrison that most of their machine tool orders will have been finished and ready for delivery by July 1.

But some special automotive machines, deliveries of which were promised late this year and in 1952, will have to be cancelled or set aside until some future date.

• • •

Meanwhile the preparation of pool orders ("phantom orders") is being rushed by Washington. These orders, to be distributed widely to the machine tool industry, are being underwritten by General Services Administration rather than the armed services. The actual placing of them is to be done by NPA's Machinery Division.

It will take some time to get pool orders into machine tool builders' hands. These orders have just been revised by a team of machine tool men who came to Washington in response to NPA's request. Purpose: to bring them into line with today's armament production needs.

• • •

The orders now are going out simultaneously for further review and criticism to individual builders and to the Munitions Board. Builders will be asked whether the sizes and types are in line with their experience to date with defense contractors.

Builders and the Munitions Board will be asked to return the tentative orders, with appropriate comments, to NPA. At that point, NPA's Machinery Division will make a final check and begin actual allocation of the pool orders. Getting the orders finally into hands of builders will consume several weeks. April 1 has been set as the date for completion of distribution.

• • •

Even after pool orders are in builders' hands, many of them won't be touched for weeks. Builders will be too busy getting current DO orders and non-defense orders out of the way.

Official name of pool orders, incidentally, is "schedules of emergency production." GSA has a $750 million revolving fund for financing the orders, which must be kept within that total. That is why orders will be limited to 40%, or perhaps 50%, of a builder's potential output for a year.

Electrical equipment, which is not an integral part of a machine, will not be included in the GSA financing.

• • •

Air Force has caused big flurry by wiring all machine tool builders that it wishes to have diverted to it all civilian orders on their order boards which may fit their contractors' requirements. Point is that Air Force does not want to wait for contractors to place machine tool orders, as red tape in Air Force itself is delaying final closing of aircraft contracts.

Air Force is going even farther. It is said to be ordering more machines than it needs "for good measure." What's more, it is buying machines for its "national reserve" to replace those units taken out by defense contractors.

• • •

DO's for machine tools are being extended by NPA to subcontractors and sub-subcontractors on defense work. This action will change radically the order boards of many machine tool builders. Heretofore the percentage of DO's to total bookings has not included such orders.

A prominent builder found, upon analysis, that 75% of its unrated orders came from defense subcontractors and sub-subcontractors.

• • •

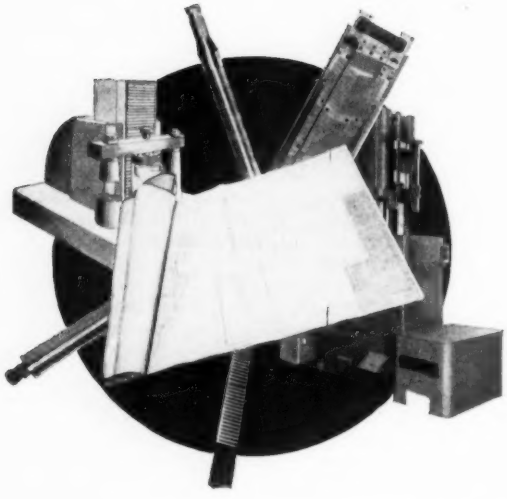
Recent additions to NPA's Machinery Division personnel: E. P. Blanchard, former vice president Bullard Co.; Robert Husband, long-time official of Cincinnati Bickford; and Paul Gaston.

• • •

Ford's Aircraft Division at Chicago has been slow in starting to tool former Dodge-Chicago plant. Hardly any of required $75 million in machine tools has been bought. Reason: dispute is reported as to whether plant should be tooled according to Ford's ideas or according to methods used at East Hartford.

• • •

Machine tool orders zoomed to a postwar high in December, thanks partly to British business. Chart and figures are on p. 116.



"Endorsed Broaching"

Are you using this free COLONIAL *service?*

One of the *troubles* with broaching is that the process is so fast and accurate that it is easy to be satisfied with the *initial* results obtained with almost any broaching installation.

Yet, time and again, Colonial Broach engineers have studied new or proposed broaching setups and pointed out where a different type of broach, machine or fixture would greatly improve the operation either as to productivity, product quality, or cost per piece—frequently all three.

Since broaching equipment is inherently expensive as to *first* cost, it is darn good protection to have an installation checked over by Colonial's broaching specialists before broaching equipment or tooling is ordered.

Once you have the equipment, *any* change usually means *increased* investment where previously it might have meant *less.*

And Colonial's "broaching protection" costs you nothing.

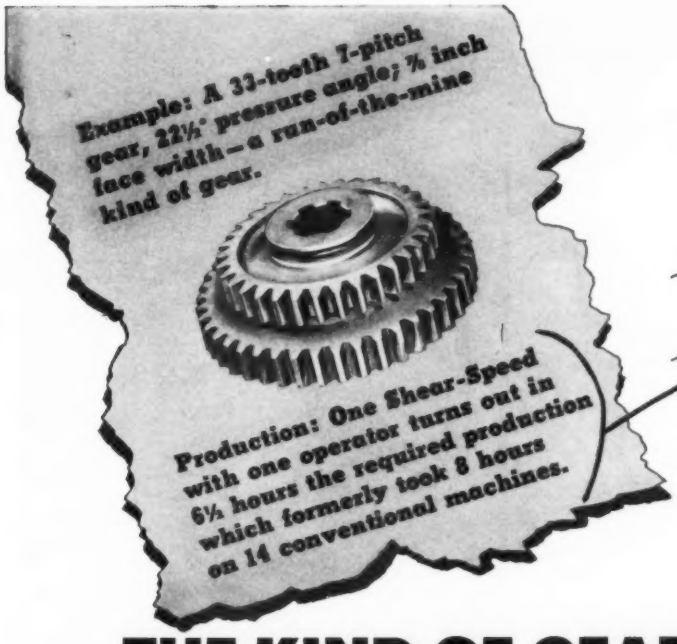
For Your Tool Room

A wall or bulletin board poster of DO and DON'T items that should help you reduce broach maintenance cost. No charge. Ask for BN-1250.

PIONEERS OF M.S.S. BROACHING

COLONIAL

BROACH CO. DETROIT 13


Example: A 33-tooth 7-pitch gear, 22½° pressure angle; ⅞ inch face width—a run-of-the-mine kind of gear.
Production: One Shear-Speed with one operator turns out in 6½ hours the required production which formerly took 8 hours on 14 conventional machines.

14
×8
112
−6½
105½ hrs. saved per shift!

THE KIND OF GEAR-CUTTING YOUR TOP MANAGEMENT "WILL GO FOR", TOO . . .

Any time you can up productivity per machine hour and man-hour *that* much, top management *is* interested.

The reason you can do this with a Shear-Speed is that it cuts all the teeth at once. The Shear-Speed doesn't care how many teeth there are or how big the gear is. Pitch and face width—total metal removal—are the only things affecting cutting time.

It's something worth talking to the big boss about. But before you do, get all the facts.

Fill in the coupon below and we'll see that you get them.

MICHIGAN TOOL COMPANY
from blank to finished gear

7171 E. McNICHOLS RD. • DETROIT 12, MICHIGAN, U. S. A.

MICHIGAN TOOL COMPANY
7171 E. McNichols Road, Detroit 12, Michigan

I would like to know more about the Shear-Speed

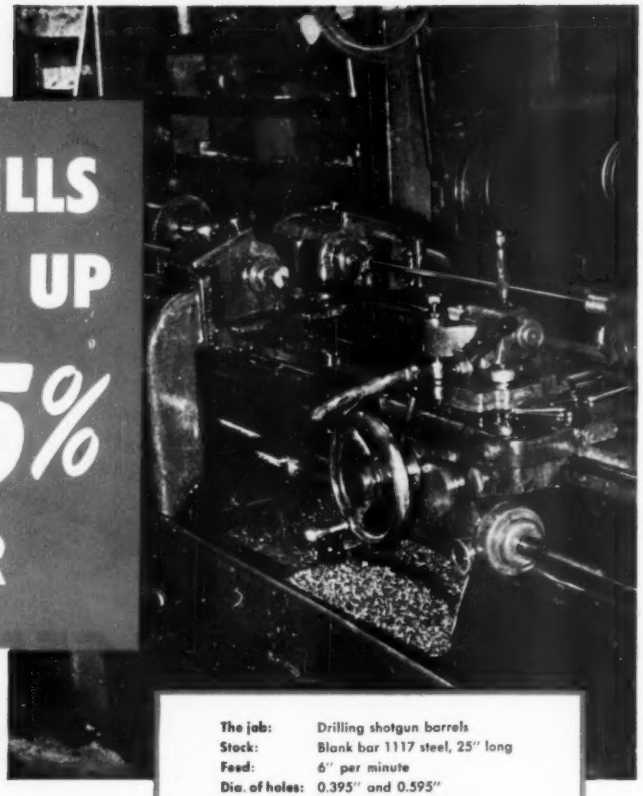
Name _____

Title _____

Company _____

Address _____

THESE DRILLS NOW LAST UP TO 75% LONGER



The job:	Drilling shotgun barrels
Stock:	Blank bar 1117 steel, 25" long
Feed:	6" per minute
Dia. of holes:	0.395" and 0.595"
Speed:	5000 rpm and 3600 rpm or 509 sfpm and 509 sfpm

Texaco Sultex Cutting Oil speeds the work, cuts the cost

On this job* Texaco was called in to see what could be done to overcome short tool life. With a competitive cutting fluid in the machine, drills were wearing badly and rounding over quickly. The Texaco Lubrication Engineer spotted the need for a totally different type of coolant and recommended *Texaco Sultex Cutting Oil* as best suited to the requirements of the metal being worked and the machining set-up.

As soon as *Texaco Sultex Cutting Oil* went into use, production between tool grinds increased 21 pieces for the smaller drill, 24 pieces for the larger —a 60% to 75% increase in tool life, with a corresponding reduction in down time for tool changes.

This is an excellent illustration of how the high quality of Texaco cutting fluids, combined with the practical know-how of Texaco Lubrication Engineers, assures better, faster, lower-cost machining—whatever the metal or the method of cutting it.

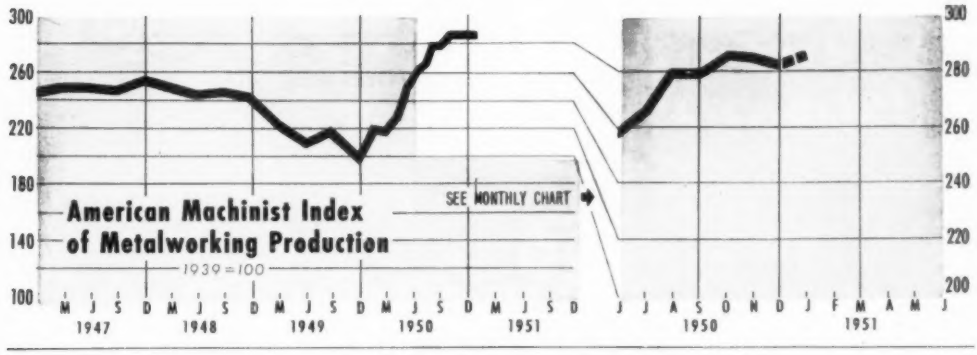
There is a complete line of Texaco Cutting, Grinding and Soluble Oils. A Texaco Lubrication Engineer specializing in machining operations will gladly help you select the right ones for best results in your plant. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

*Name of this Texaco user on request.

TEXACO

TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

Gaging Metalworking



Production Pace Maintained Despite Shortages

Despite materials shortages and conversion problems, Metalworking kept in January the production pace set in December. It may even have gained a bit. AMERICAN MACHINIST Index is estimated at 285 for January, but final figures may show it slightly below that level.

Frenzied cries for more materials are coming from many directions, but metal users in general have not laid off many men yet on account of shortages. Every producer of a civilian item is straining to turn out all he can this quarter while enough materials still are at hand. The real squeeze will come later on.

There are growing instances of metalworking companies cancelling civilian orders as more and more DO orders are placed. Many manufacturers are running tool and die rooms overtime seven days a week to tool up for defense orders and thus put production workers on new jobs as quickly as possible.

• • •

Copper promises to be the tightest of all metals. Between the second and fourth quarters the amount of copper going into direct defense work will more than double. If stockpile buying is added, the quantity available for civilian items will be very slim.

Aluminum will not be too far behind copper in the ratio used for defense needs. Steel, on the other hand, will be much freer. Even by final quarter of the year, not much more than one-sixth of all steel tonnage will be taken by defense contractors.

Some metal users, on that basis, are making plans for civilian-goods output with steel as the final limiting factor. Steel and cast iron are being substituted for copper and aluminum. Certain car makers agree with this line of reasoning.

Metalworking on west coast is seething. First quarter output in San Francisco region will hold high, but manufacturers back off from making predictions after March.

There is acute shortage of skilled machinists all along the coast.

Bay area producers are wondering where machinists will come from for Kaiser's new aircraft division and for Food Machinery's tank operations.

In Seattle, metalworking will have a first quarter on par with fourth quarter of 1950 and far ahead of same quarter a year ago.

• • •

Small metalworking shops in Los Angeles area report materials shortages are crimping operations. Nevertheless, first quarter will be very good. And no one looks for a dip after March. They expect just the opposite. Reason: more defense orders.

Most big machine companies and suppliers have sent key men east to try to get steel, copper, brass, aluminum. Meanwhile lack of materials is making it tough for non-defense users to keep running.

INDEX

	JAN. '51	DEC. '51(p)	NOV. '51(r)	JAN. '50
	285*	**282**	**283**	**221**
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Electrical Manufacturing		**329**	**330**	**246**
Automobiles, Trucks		**237**	**243**	**218**
Transportation Equipment		**295**	**292**	**208**
Other Metalworking		**304**	**305**	**246**

AMERICAN MACHINIST'S INDEX OF METALWORKING PRODUCTION is based on manhours worked in the five components above.

* Estimated (p) Preliminary (r) Revised

Gaging Business

Machine Tool Orders Zoom To Record Postwar High

	New Orders (Total)	Foreign Orders	Shipments (Total)
Oct. 1949	56.8	13.7	62.3
Nov.	84.3	17.0	67.6
Dec.	82.5	22.4	75.7
Jan. 1950	99.7	26.7	52.8
Feb.	89.2	18.8	56.1
Mar.	107.4	24.9	75.3
Apr.	98.9	17.4	61.6
May	116.4	18.4	82.5
June	124.1	23.0	91.9
July	253.1	22.3	68.3
Aug.	305.1	34.2	95.7
Sept.	280.6	27.2	101.6
Oct.	289.6	49.5	100.9
Nov.	291.9	26.6	110.9
Dec.	p410.1	p112.8	p135.7

Data: NMTBA p — Preliminary figures

Freezing of prices will not halt increases. Cost of living is likely to rise 5% or more in next year, despite controls, say informed sources. In December it was 78.4% above the 1935-1939 average.

Wages probably will go up about the same as prices. Plan is to hold rates to 10% above the January, 1950, level. Result: situation will stay flexible in both prices and wages.

• • •

Manufacturing employment touched a record high in December. Durable goods industries have added about 700,000 production workers since the Korean war began. Aircraft, shipbuilding and ordnance account for one-seventh of gain.

Total production of goods and services in fourth quarter jumped to annual rate of $297 billion, according to preliminary reports. Personal income in November was at a yearly rate of $232 billion. But increase over previous month was smallest in five months.

Current scare buying is cutting deeply into inventories, but is not as frantic as last July. Federal Reserve Board intends to put further curbs on installment credit for appliances and automobiles.

• • •

Manpower is getting tighter week by week, despite any temporary lag in production caused by conversion from civilian to defense work.

Many companies have reduced their work-week from 48 hr to 40 hr or 44 hr. That action alone takes care of a considerable drop in production, without laying off men. Natural attrition is resulting in a gradual reduction in forces. Pick-up will come later when defense production really gets going.

Good example of how this works: one midwest company making a variety of consumer goods and some industrial items has laid off only 500 out of a total payroll of 45,000. But it has slashed the work-week.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	235.4	233.6	195.6
Steel ingot operations (% of capacity)	100.9[1]	99.6[1]	89.5[1]
Electric power output (million kilowatt hours)	6,909	6,981	6,041
Production of automobiles and trucks	158,907	139,679	158,432
Engineering construction awards (Eng. News-Rec., millions)	$305.3	$391.6	$216.4

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1935-1939 = 100)*	215	217	173
Index of durable manufacturers' production (1935-1939 = 100)*	260	262	181
Durable goods manufacturers' sales, millions*	$9,909	$9,671	$6,631
Electrical machinery manufacturers' sales, millions*	$1,138	$1,131	$736
Other machinery manufacturers' sales, millions*	$1,570	$1,512	$1,087
Durable goods manufacturers' new orders, millions	$11,056	$12,171	$6,941
Electrical machinery manufacturers' new orders, millions	$1,301	$1,439	$964
Other machinery manufacturers' new orders, millions	$1,900	$2,016	$979

* Seasonably adjusted. [1] Revised capacity.

HYDRAULIC CYLINDERS

AIR CYLINDERS

RIVITORS

CLINCHORS

A tip for you on trimming costs—put T-J products to work in your plant! Engineered to *save labor* and give you *plus performance* in a wide range of applications.

For those "muscle jobs" of pushing, pulling or lifting—100 lb. or 50,000 lb.—save money by mechanizing with T-J Air and Hydraulic Cylinders! For high production in rivet-setting, specify T-J Rivitors with automatic feeding and setting . . . air or electric power. For setting clinch nuts in automotive body panels, door locks and other products . . . set 'em 3 to 5 times faster with T-J Clinchors! For more work between grinds in tough die steels . . . T-J Cutters! For accurate, automatic control of presses, brakes, other machines and equipment . . . T-J Air Controls.

That's it—get T-J *all the way* for tough jobs! Send for latest catalogs. The Tomkins-Johnson Co., Jackson, Mich.

CUTTERS

AIR CONTROLS

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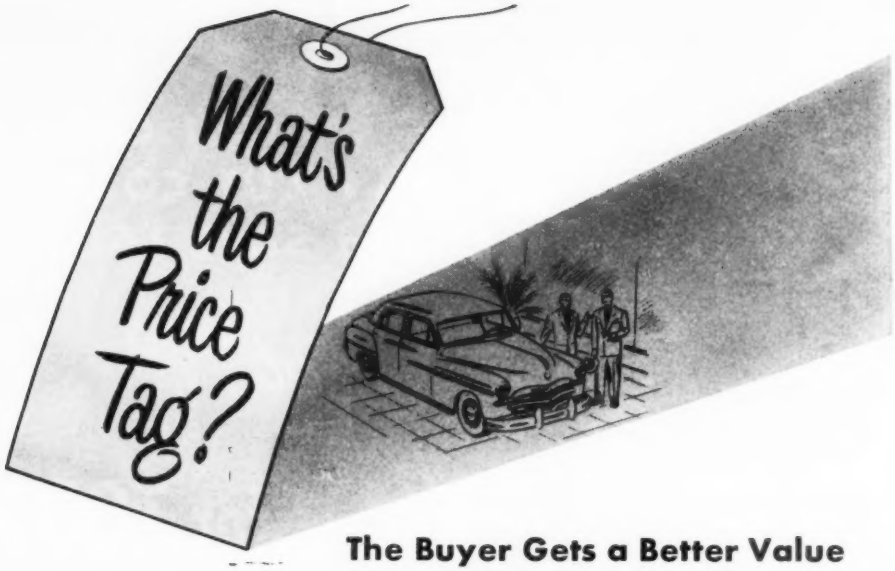
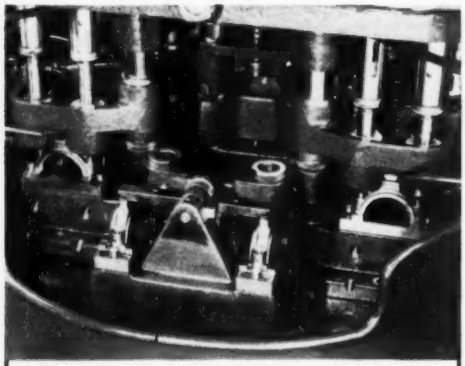
RIVITORS . . AIR AND HYDRAULIC CYLINDERS . . CUTTERS . . CLINCHORS

34 YEARS EXPERIENCE



The Buyer Gets a Better Value ...with an assist by MORRIS ENGINEERED PRODUCTION



Hand-clamped in pairs, forged steel (SAE 1041) connecting rod caps are rough spot faced, finished spot faced and countersunk (a total of twelve operations on the two parts) at a rate of one part every 8 seconds!

Automotive Connecting Rod Cap—Two Views.

In the auto plant or in the showroom . . . it's an American trait to want quality at a price. The manufacturer gets it in a MORRIS Engineered Production Machine . . . for a better product at less cost . . . and passes it on to the buyer in a mass produced car.

MORRIS Production Machines cut time and costs wherever multiple drilling, reaming, tapping, boring or similar operations are performed. In addition, a major plus feature is offered, namely, all machines are built from *standard units* to do a *special job* . . . a real savings in initial costs.

Just mention your specific problem. Chances are, in our forty years, we've handled a similar problem and can show you cost-saving facts and figures.

Builders of MOR-SPEED Line

THE MORRIS MACHINE TOOL COMPANY

933 HARRIET STREET CINCINNATI 3, OHIO

"A better product at less cost — with MORRIS ENGINEERED PRODUCTION."

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Subcontracting Will Speed the Job

Subcontracting is on the upsurge again. Its successful use in World War II was one of the reasons why Metalworking was able to turn out war goods so prodigiously. It is to be an indispensable part of the new defense program.

That should be welcome news to the smaller metalworking companies. And to many of the bigger manufacturers, too. For the times ahead are likely to be tough for those who do not participate in some form in defense production.

SUBCONTRACTING already is proving a boon to aircraft output. Boeing has revealed that over 38% of its Air Force funds are being spent with subcontractors.

General Electric achieved the feat of subcontracting all parts and subassemblies for the turbojet for its Lockland, Ohio, plant, confining its own operations to final assembly and testing.

Wright Aeronautical is now seeking help in making parts for its Sapphire jet engine. With the aid of the Air Force, it has held meetings in various cities to put itself in touch with prospective subcontractors. More than 400 smaller manufacturers attended the first day, and 275 the second.

What's happening at Wright's is taking place all over the country.

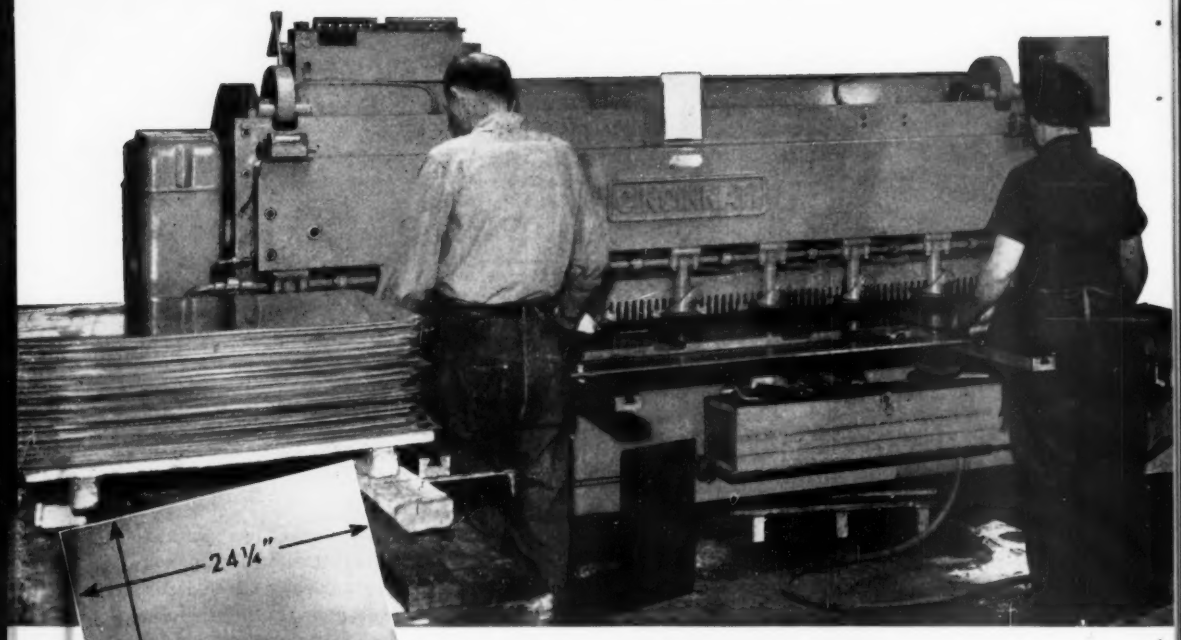
SUBCONTRACTING has many advantages. It spreads the benefits of large contracts on a broad geographical basis and in a minimum of time. It provides multiple sources of supply, thus reducing the danger that a single bombing raid on one strategic center might knock out war production.

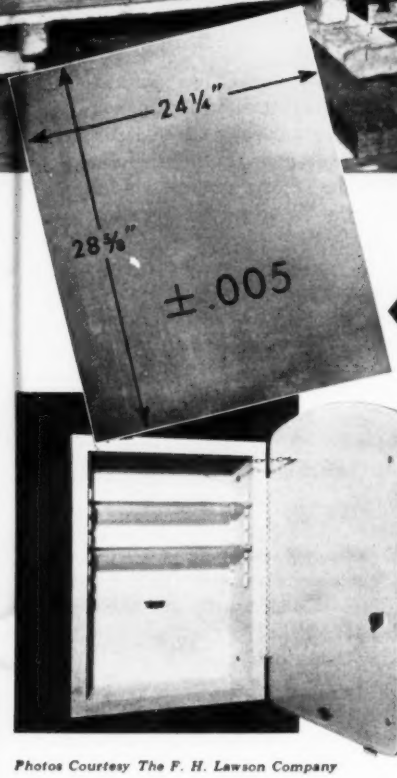
It gives the large prime contractor the use of the specialized techniques of the subcontractor. It enables the latter, on the other hand, to be a member of a team in major government programs which he alone could not handle.

It means the least possible disruption of the labor force, because workers can stay where they are, yet fully employ their talents. It utilizes existing equipment and gets the job going faster than otherwise would be possible.

WE ARE IMPRESSED by the swiftness with which both the Air Force and the Ordnance Corps of the Army have taken to subcontracting to get their present procurement job done. It is the best possible way in which to use our vast industrial resources. We hope that the armed services will continue to have the wholehearted cooperation of all manufacturers, large and small, in this sound and constructive program.

Burnham Finney





Photos Courtesy The F. H. Lawson Company

These accurate blanks are held to tolerances of ± .005" on Cincinnati Shears in the shops of The F. H. Lawson Company, manufacturers of medicine cabinets, pails and all sorts of containers.

ALL ALONG THE LINE

←····· this accurate blank

SAVES MONEY!

At 400 an hour, accurate steel blanks, 24¼" x 28⅝", are produced in lots of 10,000 from 26 gauge stock sheets.

Costs are low because of the accurate performance, rapid gauging, ease of control and safety features of Cincinnati All-Steel Shears. One and one-half to two million cuts are made before knives need regrinding—an important factor in the low cost.

The shear is so accurate that all along the production line rejects are very low. Gauging for forming and bending operations is simple and rapid, assembly is smooth, time and money are saved, and a high quality of product is maintained.

Write for your Shear Catalog S-5. Consult our Engineering Department on your shearing problems.

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS SHEARS BRAKES

Metal-cutting test in process on a Warner & Swasey turret lathe. Test observer watches operation closely for signs of tool failure or other unusual conditions

SHOP TESTS DEVELOP EFFICIENT MACHINING

BY G. W. HALSTON • SUPERVISOR OF WORK-MEASUREMENT, DE LAVAL STEAM TURBINE CO.

How can a specific metal be removed most economically? Here's a shop that is making actual tests of cast iron, cast steel, and bronze to find out. Result is tables covering varying conditions from which the most economical combination of feed, speed, and depth of cut in relation to tool life can be found

ECONOMICAL metal removal is essential in most metalworking plants because production costs and operating profits are largely controlled by the rate of metal removal.

Fundamental to any serious consideration of this problem are two basic facts: First, the machine. Any metal-cutting machine was purchased only for the specific purpose of removing metal and it will be profitable to remember that its original purchase cost, plus maintenance cost, plus power and tooling cost, should be paid for out of the income received from metal cut on that machine. Second, the continuing cost of direct labor engaged in metal-cutting operations must be paid out of this same source of income.

Thus it is important to find out what an economical rate of use actually is. The first place to look probably would be at the mass of available data on metal-cutting recommendations. As an example, for a carbide-turning cut on SAE 1020 steel with $\frac{1}{8}$-in. depth of cut and a $\frac{1}{8}$-in. feed, available data permits a choice ranging from 158 to over 500 sfpm without any supporting explanation relative to

tool life or horsepower requirements which are necessary to clarify this breadth of recommendation.

The difference between 158 and 500 sfpm is 216%. A more definite answer is clearly desirable. If the machining cost on any operation could be more than cut in half it would open startling possibilities for making manufacturing improvements.

It was for this reason that we established a project for the purpose of providing a reasonable answer to the question: How can a specific metal be removed most economically?

Because the required answer would have to include varied conditions of operations on the usual variety of machines it would be most economical to establish basic data which could be related to these variables. They include different metals, several types of steel, a wide range of horsepower available, small tools and large tools, rigid and semi-rigid toolholders, rigid and less rigid machines, as well as differences in rigidity inherent in the work itself. It was decided to run actual tests on a convenient machine, taking all cuts with standard carbide tools.

A relatively new Warner & Swasey chucking turret lathe, powered by a 15-hp motor, was selected for the tests. Test billets with 9-in. dia and 12 in. long were cast in our foundry. Steel and bronze billets of this size were ordered from suppliers. Some of the billets were solid and some had a 3-in. cored hole. These materials are to the same specifications used on most of our iron castings and on many cast steel and bronze parts. Tests on other materials will be taken on parts during actual machining operations and correlated to the basic data obtained in the tests.

Rough turning a steel forging—one of the operations to which test results have been applied. A standard carbide tool is cutting at 362 sfpm with 0.033-ipr feed and ¼-in. depth of cut. Machine is a 42-in. Bullard and the operation requires 16-hp input to remove metal at 17.9 cu in. per min. Cut area remains at comfortable room temperature

TOOL DESTRUCTION TESTS

Bar No. 110
Dia 9 3/4"
Length Cut 11"
Outside Brinell 207-212
Carbide Tool 1307A-188
220 Volts

Test No. 334
Material Cast iron
Cut Rough turn
Depth of Cut 3/16"
Feed per rev 0.027"
Sfpm desired 200

Cut	Bar Dia (in.)	rpm No Load	rpm Load	Amp	Cutting (Min)	Sfpm	Conditions
1	9¼	94	83	27	4.82	201	Nose crater -.010 wear Blue tip & shank
2	8⅞	86	84	28	4.75	195	
3	8½	90	89	29	4.48	198	0.015 in wear
4	8⅛	94	93	30	4.33	198	SC* 8⅜ in. long
5	7¾	99	101	30	3.88	205	SC ⅞ & 10⅛ in long
6	7⅜	104	104	32	3.85	201	SC 1⅞ in. long Glassy, tool chipped
			6/176		6/1199		
*Size change				29	26.11	200	← Test result

Input hp 8.6
Surface finish 250
Date 12-16-46
Observed by ..... N. B. C.

Metal Removed:
Total cu in. 316.98
Cu in. per min 12.1

Each tool destruction test is recorded on this form. Averages and totals from the bottom line represent one test and are entered in the summary form and plotted in Charts I and II

Preparation of Billets

Test billets were skinned before actual cutting tests were taken, with scale-cutting tests to be taken separately. Carbide tools were used in all tests except drilling. The turning tool was offset, with a ¾x1¼x6-in. shank, and the following tool angles:

Back rake	0
Side rake	6°
End cutting edge	10°
Side cutting edge	0
End relief	6°
Side relief	6°
End clearance	10°
Side clearance	10°

An ammeter was plugged in the line at the machine. A rheostat was connected so that constant

sfpm could be maintained during a test. Tool shanks on test tools were stamped for identification. A machine operator and test observer were selected.

The test observer took approximately 48 Brinell readings on each billet before the machining test. He would also take tachometer readings on the spindle before and during each separate cut, record the ammeter reading for each cut, set the rheostat for desired sfpm, time and record the decimal minutes for each cut, and measure the billet after cuts when necessary to record size change.

In addition the test observer noted changing conditions of the machined surface, such as size change, or of the cutting tool, such as crater or chip, and included these in the record of the test. Each test was recorded on a "Tool Destruction Tests" form.

Specification of Tests

Actual cutting conditions were determined in advance and a listing of specific cuts was furnished to the test observer, detailing the depth of cut, feed, sfpm for each cut and specifying the billet number. Actual tests were also observed periodically by the engineer

TOOL DESTRUCTION TESTS

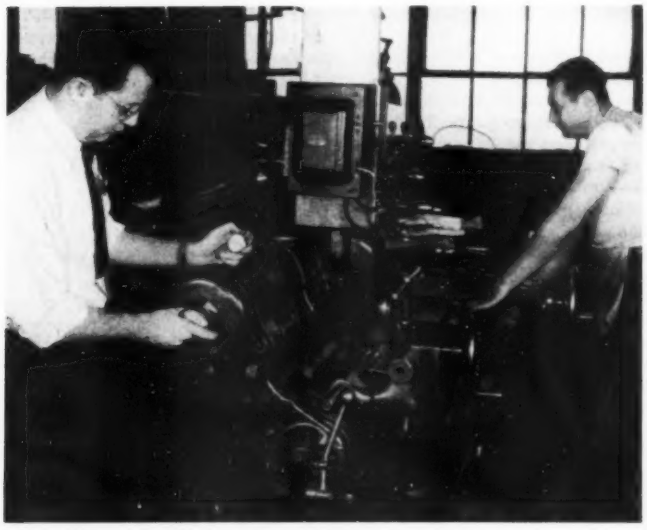
SUMMARY SHEET

ROUGH TURNING CAST IRON

3/16" DEPTH OF CUT — FEED 0.027 INCHES/REV.

SFPM	TOOL LIFE MINUTES	BRINELL READINGS	METAL REMOVED CUBIC INCHES PER GRIND	METAL REMOVED CUBIC INCHES PER MIN	INPUT HP	TEST NO.
200	67.0	143-187	820.0	12.2	7.7	26
269	7.0	212-217	108.5	15.1	11.4	92
239	31.0	149-170	445.6	14.5	7.9	126
496	2.5	187-217	73.5	30.0	19.8	277
495	2.3	"	71.1	30.3	20.1	278
436	2.6	"	68.5	26.6	17.4	279
329	6.5	"	130.1	20.3	13.6	280
279	10.5	187-197	176.8	17.0	11.2	281
232	14.0	"	201.7	14.2	9.3	282
211	16.0	"	208.5	12.8	9.7	284A
366	8.6	149-163	188.6	22.0	12.4	300
700	2.0	156-166	85.3	42.0	24.3	311
249	15.0	163-166	227.0	15.1	8.8	320
547	4.5	146-166	145.6	32.5	17.1	322
680	1.1	163-183	43.8	40.2	26.5	323
629	3.1	"	118.0	37.6	21.0	324
382	13.0	116-149	300.1	22.6	12.7	325
404	3.5	116	85.3	24.3	12.7	332
680	2.6	131	106.6	41.0	23.1	333
200	26.0	207-212	317.0	12.1	8.6	334
259	17.0	170-183	264.6	15.9	9.7	345
400	8.6	170-179	206.7	23.9	14.5	346
412	3.1	187	53.2	17.0	15.3	383
415	4.2	187-197	103.5	24.7	15.9	383B
532	1.4	179	36.8	27.2	18.3	384
512	3.8	187-197	113.8	30.2	20.1	384B
465	5.4	149-163	149.6	27.8	15.0	399

Tool destruction tests for one material and one feed and cut depth are entered on this summary form. Test shown in detail in the first form is No. 334, summary of which is indicated by arrow near the bottom



Spindle speed is checked during test. A rheostat is included in the circuit to maintain surface speed desired for each cut

TURNING CAST IRON

3/16" DEPTH OF CUT

30 MINUTE TOOL LIFE

FEED	SFPM	CU IN. MIN	INPUT HP	SURFACE FINISH
0.044	145	14.3	9.0	
0.037	160	13.3	8.5	1000
0.032	175	12.6	8.5	
0.027	190	11.5	8.0	250
0.024	210	11.3	8.0	125
0.020	230	10.3	7.5	
0.015	260	8.8	7.0	
0.011	275	6.8	6.5	63

Standard cutting conditions are tabulated after curves have been drawn on Charts I and II. These tabulations, one for each desired depth of cut and tool life, serve to establish machining rates for actual operations. Standard rate for the depth of cut and feed illustrated on the other forms is indicated by arrow

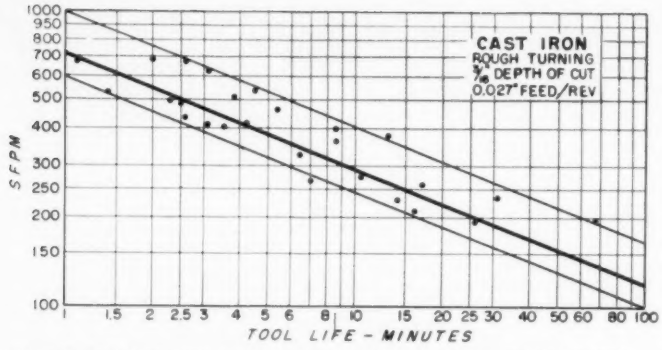


Chart I. Individual tests are plotted on logarithmic charts like this for each depth of cut and feed. When enough tests have been made to draw the curves, points from the heavy line are tabulated as standard cutting conditions

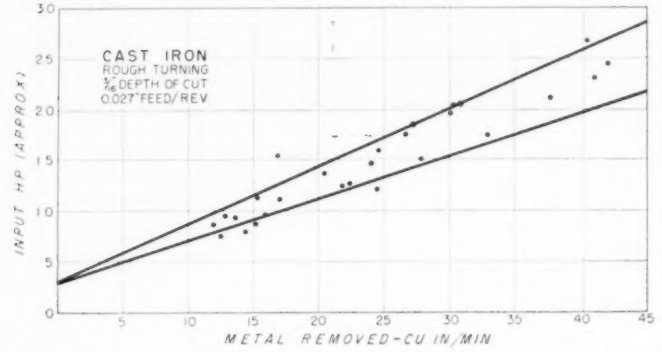


Chart II. Input horsepower and metal removed are plotted in this chart and when the lines are established, points are tabluated in the standard cutting conditions along with data from Chart I

to provide a cross-check and to note any unusual deviations from predictable cutting conditions that might occur.

As each tool destruction test was completed, the test sheet was calculated to obtain the cubic inches per minute, input horsepower, average sfpm, and actual cutting minutes spent during useful tool life. This data was then recorded on the tool destruction test summary and plotted on Charts I and II.

Analysis of Results

Results were analyzed until it appeared conclusively that tool life had been established for a specific cutting condition. The curve was drawn and standard cutting conditions were tabulated for an economic tool life of 30 min, 60 min, or whatever the particular situation demanded.

The result of these analyses was to establish an economic rate of metal removal for similar conditions of operation where economic tool life might vary from 30 min to possibly 2 hr.

Under conditions limited by available horsepower, machine rigidity, clamping pressure, and tool strength available in the actual setup, it was necessary to run additional tests on the actual operation. The one factor least subject to change is the inherent rigidity of the work itself. Pieces clamped on thin-wall sections are subject to excessive distortion which limits an otherwise economic rate of metal removal and imposes a longer tool life than would otherwise be necessary.

Mechanical differences that occur on some machines require a modification of the conditions. It is not possible, because of these variables, to present a tabulation that would include all conditions to be encountered in practice. However, it has been satisfactorily established that few cuts, with any standard carbide tool, need be taken slower than 150 sfpm with 0.006-ipr feed and $\frac{1}{8}$-in. depth of cut. It has been found, in these tests, that a feed of 0.006 or 0.007 ipr will produce, with any standard-nose tool on nearly all steels, a fine smooth finish that measures 63 microinches. A feed of 0.011 or 0.012 ipr will produce the same quality of finish on cast iron. As the feed is increased the spiral cut lines become more visible and the finish, therefore, progressively loses its smoothness.

Conclusions

In general, for most materials tested, it has been found that a reduction of 25% in surface speed will increase a 30-min tool life to 60 min and a further 15% reduction will extend the tool life to 2 hr.

Although tests have not yet been completed on all conditions, the findings are already being applied to actual operations. From the tables of standard cutting conditions it is possible to select the machining rate that will most efficiently utilize the capacity of a given machine tool.

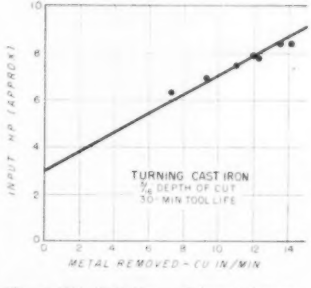
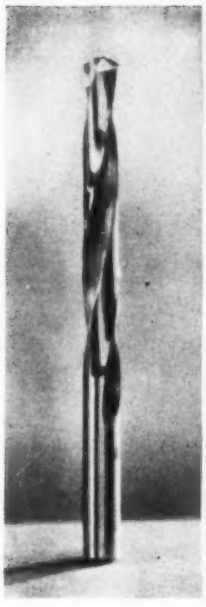
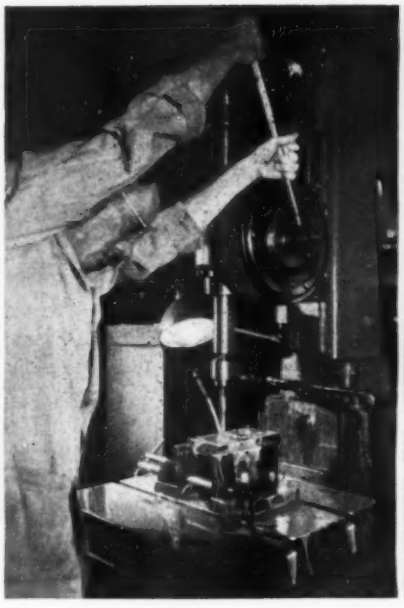
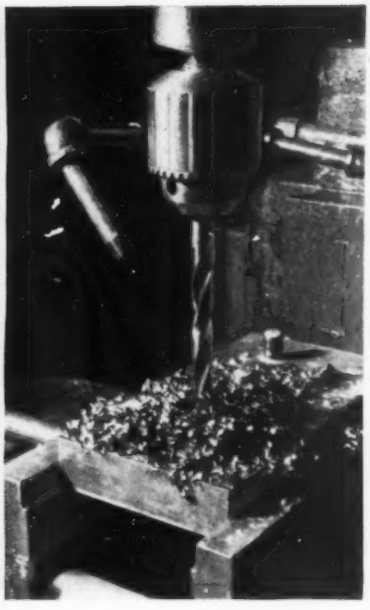


Chart III. Relation of input horsepower to metal removed for given cut depth and tool life can be plotted from the tables of standard cutting conditions







HOW TO DRILL HARDENED STEELS

BY R. DOUBLE, Hq. Mfg. Eng. Dept.,
WESTINGHOUSE ELECTRIC CORP.

You can overcome hardness up to 65R_c in tool-steel parts with careful methods and a drill designed specifically for the job. Tests made at Westinghouse prove that a carbide-tipped twist drill similar to type 1400 made by Whitman and Barnes can operate efficiently at 180 to 200 sfpm through hardened high-carbon steel without killing the temper at the edge of the hole.

The drill has a 130° included angle, positive rake, and 12° clearance. The shank is HSS, has two flutes, and is formed with a conventional twist. Operation is on a sensitive drillpress with good bearings, tight belts, and a healthy power reserve. Coolant is water or soluble oil in a heavy flow.

Compared to most-used drills for cutting high-carbon steel, this one cuts freer and requires less power than the straight, negative-rake, carbide drill recommended by many manufacturers, and reduces hardness around the hole almost negligibly as compared to 10 points R_c with a pyramid-point, three-flute straight drill which anneals before it actually cuts.

Pick a taper-shank drill if possible; if not, grip the straight shank with a Jacobs-type chuck in top condition, not with a V-shank or hand-tightening chuck. Make the setup with work clamped securely over a back-up plate to insure clean break-through.

Centering and starting the drill is critical; lead-off could easily cause drill breakage. Spot the hole with a small carbide centerdrill and install the hole-size drill without changing the setup. Drill a lead hole for diameters over ¾ in., and use a four-flute core drill for larger holes. Start contact of the hole-size drill slowly, increase pressure until a good chip is built up, then feed more forcefully for penetration. Two hands are almost necessary to prevent sudden break-through. Power feeding is not recommended for any case.

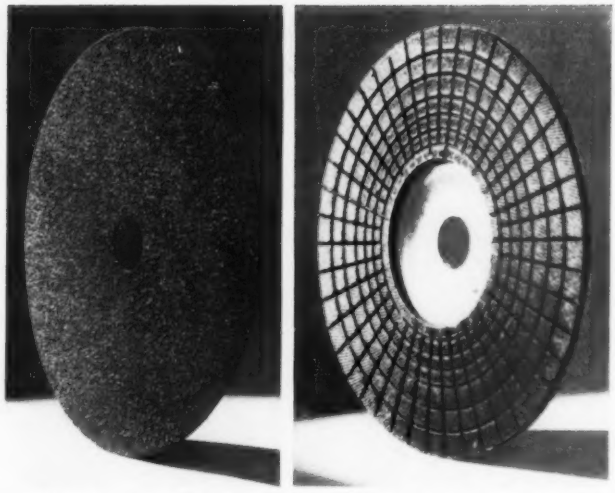
Sharpen the drill by machine if possible. Hand-sharpen with care to make sure the point is on center. Rough the carbide with a 100-grit diamond wheel, finish with a 200-grit diamond wheel; or rough with an 80-grit silicon-carbide wheel and finish with a 100-grit wheel of the same kind. Sharpening should be frequent, pressure should be light, and coolant should be applied freely.

The problem of reaming the hole can be solved with a four- or six-flute carbide reamer with positive rake, following the same general methods and precautions as when drilling. If reaming is planned, leave this much stock on a side:

Diameters ¼ to 3/8	1/64
Diameters 25/64 to 1	1/32
Over 1.00	3/64

Hand feed at 90 to 100 sfpm with a six-flute reamer is most effective.

ABRASIVE DISKS... SINGLE OR MULTIPLE LAYER?



Old and new: Single-layer sanding disk with fiber back and resinoid bond (left) compared with multiple-layer disk with a vulcanized fiber back

Are multiple-layer disks preferable to sanding disks? Sometimes yes; sometimes no. Here is a report on this recent development that will help you choose the better disk for each application

BY E. W. FARMER, BAY STATE ABRASIVE PRODUCTS CO.

THE latest abrasive development is a cross between a regular grinding wheel and a flexible-coated abrasive disk.

For many years, the more or less standard tool for light stock removal in blending and finishing welds, removing rust or scale, and similar metalworking jobs has been the single-layer coated abrasive flat disk—or sanding disk. It is used in extremely large quantities on right-angle portable grinders and sanders.

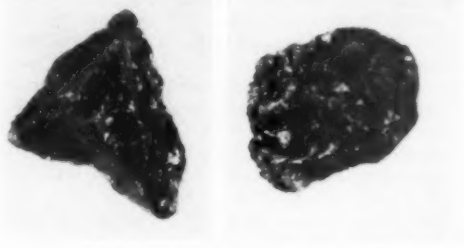
Chief advantages of the sanding disk over the conventional grinding wheel, as well as over the new disk, are its greater flexibility for contour grinding and its low initial cost. There are several grades on the market today, but only the heavy-duty, fiber-back, resinoid-bonded disk is considered in this comparison.

A typical heavy-duty sanding disk is made up of sharp-edged, roll-crushed aluminum oxide. The particles of abrasive are adhered in a substantially single layer to one side of vulcanized fiber sheets prior to dieing out to required diameters. In a 9-in., 60-grit sanding disk there are approximately 800,000 individual pieces of abrasive grain. Before the new adhesives, such as phenolic resins, were developed, the abrasive particles were stuck to the fiber or cloth-fiber sheets with ordinary glue.

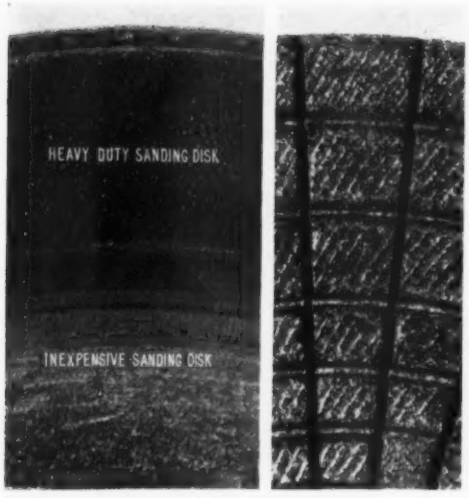
The new abrasive disk, made in both depressed center and straight shapes, has several layers of abrasive particles. The over-all thickness of the layers totals ⅛ in. and there are approximately 5,800,000 individual abrasive particles in a 9-in., 60-grit disk.

This means that in comparable grit sizes and disk diameters there are about seven times as many particles in the multiple-layer disk as there are in the single-layer disk. The abrasive itself is more chunky and of a block type, rather than sharply angular, so that it does not dull as quickly on metals.

Experience has shown that it is generally more satisfactory to use a finer grit in the new disk than in the sanding disk to obtain comparable results on the same job. In other words, if the grit size in a sanding disk is No. 20, the proper grit size in the multiple-layer disk would be No. 36. This applies up to and including grit size No. 54. For anything finer



Sharp-edged aluminum oxide (left), typical of the abrasive in single-layer disks, compared with the chunky abrasive of multiple-layer disks



Sanding a weld for 10 min did this to two single-layer disks (left) and a multiple-layer disk

than this it is satisfactory to substitute grit size for grit size.

The backing of the multiple-layer disk resembles the strong vulcanized-fiber backing of the heavy-duty sanding disk, but has several additional mechanical improvements. The success of these new disks lies in the manufacturer's ability to build up the layers of abrasive particles into a thick coating that is held to the backing until each individual abrasive particle is worn away.

Sometimes the multiple-layer disk does not have sufficient flexibility to do the job required and the sanding disk must be used. However, it is flexible enough for many jobs. This flexibility comes from the scored circle and lines radiating out from the hub to the periphery. These lines penetrate to the backing itself. If they were not present, the solid mass of abrasive would crack and fall away from the backing when the disk was bent in operation. In other words, without these scored lines it would be a solid grinding wheel.

The multiple-layer disk can be safely used at speeds up to 5500 rpm for a 7-in. dia and 4500 rpm for a 9-in. dia.

Removing lacquer or enamel from automobile and truck fenders of bodies has always been a troublesome problem in automotive repair. The multiple-layer disk cannot yet accomplish this job satisfactorily because of loading. Sanding disks have an advantage in this respect because they do not load as readily.

By "loading" is meant that the cutting surface becomes filled with foreign matter so that the abrasive particles cannot function to full advantage. The firms that manufacture these disks are trying to overcome this problem.

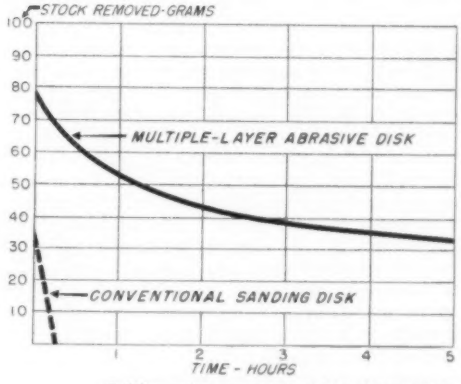
Neither the single- nor multiple-layer disks are suitable for working on wood. Regular abrasive-coated paper is still the best product for this purpose. Because of the light bonding or gluing of the grit to the paper backing, there is more chip clearance to carry away the dust.

Laboratory efficiency tests were made to determine the difference between the rate of cut between the single- and multiple-layer coated disks.

The results, shown in the chart, show a relatively constant rate of cut for the multiple-layer disk. In contrast there was a rapid drop in cutting ability of the sanding disk after the first few minutes. After four hours test operation the multiple-layer disk was only half consumed.

In addition to many different grit sizes, the disks are also available in a wide range of hardness grades and structures not known to have been previously offered in a flexible abrasive disk. This allows better control over the rate of cut and finish than is obtainable with sanding disks.

Initial cost of the multiple-layer disk is nearly five times more than the cost of the single-layer disk, but when considering the longer life, labor saving, and other features, the multiple-layer disk is considerably less expensive and, in the end, generally more satisfactory.



Cutting rates compared of 9-in., 60-grit disks mounted on a right-angle sander and operating at 4500 rpm. Material cut was mild steel

Micarta back-up pad (left) lends support to the disk without hindering flexibility. Metal adapter (right) is required. Rubber pads with integral adapters are also satisfactory

GOOD CARBURIZING PRACTICE

VII... How to Select Case Depth and Refine the Case

Slow cooling may be practiced to permit intermediate machining operations. But at some point the steel is reheated one or more times to a temperature above the transformation range and quenched. Case and core properties, also distortion, are affected by post-carburizing heat treatments

BY T. A. FRISCHMAN, Chief Metallurgist
Axle Division, Eaton Mfg. Company

MEANS for the specification and measurement of case depth are important if the objectives of carburizing are to be realized. Case depth, as herein discussed, refers to that portion of the outer surface of steel articles that have been purposely enriched with carbon above that of the original carbon content. This statement, therefore, indicates reference to total case depth has long been a controversial one, always bringing up the question of where does the case terminate and how much of it is actually effective? (Ed note: See "Methods of Measuring Case Depth"—Reference Book Sheets, *AM*—May 29, 1950, p101).

Some metallurgists regard all of the carbon-enriched portions as case depth, whereas others argue that effective case depth only should be considered. By "effective" is meant that portion of the case that is quite fully hardened say to 50% martensite or to a point in hardness equivalent to Rockwell C50. Such a finite demarcation between case and core is necessary from a scientific angle. In practice, where case depth must be quickly ascertained such as before unloading the furnace, or removing a periodic charge, or releasing material for the operation following carburizing, simple and rapid means of evaluating case depth are mandatory.

Determination of case depth on a part is not as simple as determining hardness. When the case depth is determined directly on the part it must be cut up or fractured, which destroys it for further useful service. The case depth is then measured inward perpendicular to the surface and is revealed or outlined by one of several different methods to be described later. Where parts are small and inexpensive, destroying them in the manner just described is both a simple and reliable procedure, but where larger parts are carburized, test pins, test bars or scrap pieces are customarily employed for determining the depth.

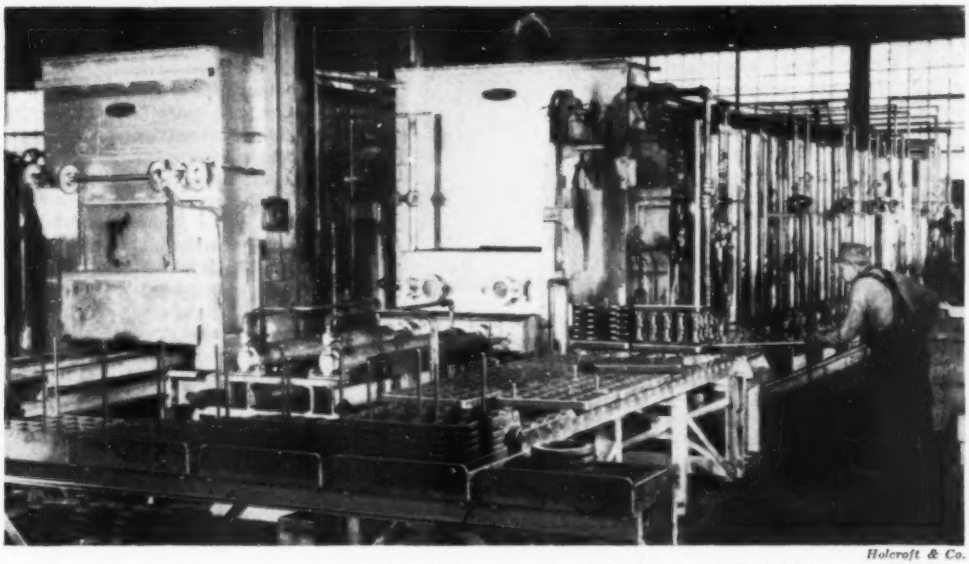
Case-Depth Ranges

Case depth can be arbitrarily divided into several ranges: light, medium, heavy, and extra heavy. Shallow cases generally are considered to be below 0.020 in. Medium cases run between 0.020 and 0.050 in.; deep cases, over 0.050 through 0.080 in., and extra-deep case, from 0.081 to 0.250 in.

Three factors must be considered in selecting case depth. These are: (1) the kind of service to which the part is subjected, (2) its physical dimensions, and (3) the type of steel from which it is made. Average spread for commercial carburizing limits depends upon the range selected. It is smallest for shallow-case work and greatest for deep and extra-deep work. For medium-case depth, a 0.010 in. spread is quite common and is slightly more for deep and extra-deep case work. Such limits, however, depend on the degree of uniformity required, and more so on the type of carburizing equipment available. The production heat treater is more prone to work to the high side of the range, reckoning it is better to be over the limit than under. More often than not, a deeper case than required is a better gamble than one not deep enough. If brittleness is satisfactory, the deeper-case part will have more strength, less resistance to indentation, or deformation under high unit loading, and sufficient depth to permit grinding as intended.

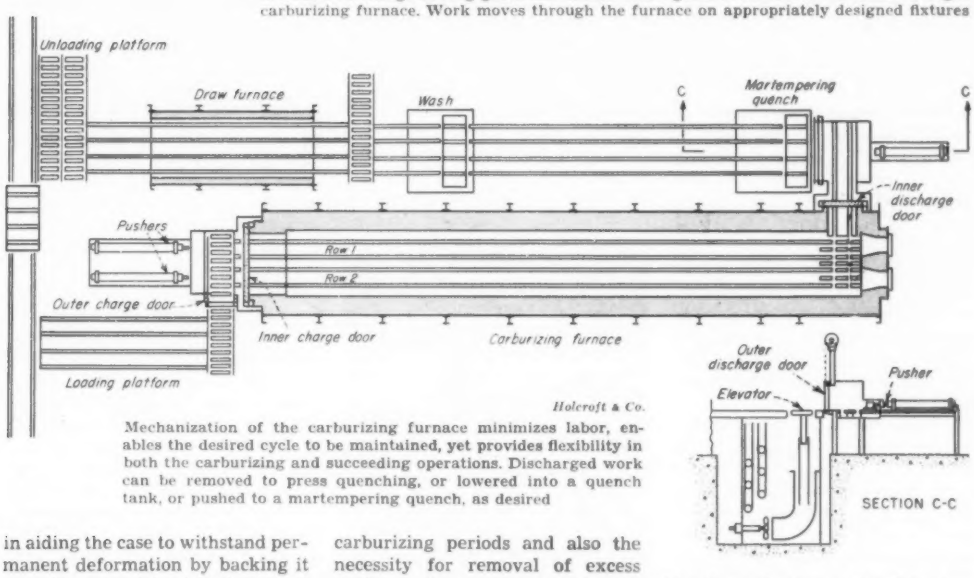
Parts which are carburized primarily for good resistance to wear, under very light loading conditions, obviously require only shallow cases. If any grinding is done subsequent to carburizing and hardening, it must involve very little stock removal, lest too much of the best wearing portion be ground away.

Where intermediate loading conditions, coupled with some measure of fatigue resistance with good wearing qualities are demanded, the case depth must be increased. In this sort of application core hardness begins to become a factor



Holcroft & Co.

A combined charge of ring gears and transmission gears is loaded into a continuous gas carburizing furnace. Work moves through the furnace on appropriately designed fixtures



Holcroft & Co.

Mechanization of the carburizing furnace minimizes labor, enables the desired cycle to be maintained, yet provides flexibility in both the carburizing and succeeding operations. Discharged work can be removed to press quenching, or lowered into a quench tank, or pushed to a martempering quench, as desired

in aiding the case to withstand permanent deformation by backing it up with material of higher yield strength. Increasing the hardness of the core, and thereby its yield and tensile strength, under these circumstances either requires using higher carbon content than is customary for carburizing or else specifying mildly alloyed steels. Again, it is a good plan to provide minimum grinding stock, not only from the economy angle of shorter carburizing periods and also the necessity for removal of excess stock, but the more important angle of maintaining as much of the outer higher carbon surface layers as possible for best wear resistance.

When service requirements call for deep or extra-deep cases, higher alloy steels are generally selected, because service conditions become more exacting. Here one often finds the part exposed to various combinations of stresses: bending, impact, torsional and compressive, along with conditions causing wear. To combat these factors deeper carburized cases, as free as possible from residual stresses, are used to supply the necessary strength in combination with sufficient alloy additions to harden the case and core in large sections. The higher alloy steels such as SAE

2500, 3300, 4800 and Krupp analysis (4.5% nickel-1.50% chromium) develop excellent core properties. Where they are only partially enriched with carbon, such as in the gradation zone, and in portions adjacent to the original core, relatively high hardnesses are obtained. This quality is an aid in reducing the total case actually required. This is true, especially, if case-depth measurement is based upon establishing a definite hardness figure at a given depth below the surface.

Selecting the proper depth of case from a practical standpoint is in most instances tied up with experience. The literature contains several formulas, factors and ratios between depth and thicknesses of section. So many other variables enter into the problem that these empirical formulas are not always entirely reliable. The best and safest course is to specify sufficient case, based on sound judgment and consideration of all factors involved, in conjunction with laboratory tests correlated with service conditions.

Post-Carburizing Treatments

After carbon enrichment of steel to specific concentration and depth of penetration, a choice of subsequent treatments is available. These post-carburizing treatments may be: (1) cool the work in air, in carburizing compound or in gaseous medium for either intermediate machining operations or for one or more reheating treatments, or (2) quench from the carburizer, either directly or after an intentional delay.

Let us first consider the effects of slow cooling. Work cooled in carburizing compound, especially where large containers are used, has a tendency to become decarburized. Some of the intermediate surface carbon is lost from reversal of the carburizing reaction in the temperature range below 1400 F., or thereabouts. Where sufficient grinding stock is provided or where controlled-atmosphere furnaces are employed for rehardening operations, carbon loss is no obstacle. On the other hand, decarburization cannot be tolerated if gear teeth will be finished solely by lapping.

Carnegie-Illinois Steel Co.

A pot-cooled and reheated carburized case may show a carbide network in the microstructure. 500 x

To circumvent decarburization, various procedures are used. In some plants, vent holes are drilled in pots. In other plants, the lids or covers are removed immediately upon discharge of the pots from the furnace. Sometimes, parts are dumped hot from containers and allowed to cool in air, or containers with the work in them are air cooled. Cooling work to black heat, while within containers in the furnace, is particularly conducive to decarburization.

If air cooling of pieces individually, or within containers, or within gas-filled chambers, does not leave the material soft enough for intermediate machining operations, a tempering treatment must be employed. Although, this might seem an expensive way of doing things, it is nevertheless often much cheaper in the long run than incurring high tool costs from work with hardness above the economical machining range.

Slow-Cooling Applications

Slow cooling after carburizing is not always done for the purpose of intermediate machining operations. Most slow cooling procedures are employed for subsequent rehardening heat treatments, either single or double. As most of us know, the single reheating treatment has many applications, depending upon what hardening temperature is used. If case refinement and maximum surface hardness only are desired, with no importance attached to core properties, a temperature slightly above the lower transformation temperature is all that is necessary. However, if carbon concentration is high, a cementitic or carbide network is formed almost invariably by this procedure. The carbide network makes the case susceptible to spalling in service and causes checking in grinding. That is why fast cooling, as well as quenching from the carburizer, is practiced.

On slowly cooled material, a good combination of case and core properties can be obtained by reheating to a temperature at or slightly above the upper transformation temperature of the core. This is referred to as a single quenching treatment. Thus, both the case and core become hardened, giving the part increased strength and resistance to shock.

Single-Quenched Work

Treatments such as the foregoing are employed where parts are to be fixture quenched, and where it is not always feasible to quench parts individually from the carburizer due to the large quantity being discharged all at once from the furnace. Examples are internal splines, differential crosses, small gears, and roller bearing races. However, it is not always practicable to quench such parts individually from the carburizer due to the large quantities being discharged at once from the carburizing furnace.

Double quenching after cooling from the carburizer was very popular at one time, especially before development of fine-grained steels. Purposes of the treatment were: first, to refine the core by quenching from above its full hardening temperature; second, to refine the case by reheating and quenching from a somewhat lower hardening temperature. Production shops seldom use this procedure now. In automotive gear shops particularly, only one hardening treatment is employed, wherever possible. This procedure is to quench the part from the carburizer directly into the quenching medium.

There is, however, an excellent application of the double-quenching procedure for fine-grained alloy steels. The treatment provides high wear resistance to rolling friction. Parts are quenched from the car-

burizer to prevent carbide separation from the solid-solution austenite. Next, a rehardening heat treatment from within the transformation range refines the case microstructure. However, more distortion occurs than from a single direct quench from the carburizer, because of additional thermal expansions during heating and cooling cycles.

Where grinding stock can be provided, the double-quenching treatment produces a case that is about the best available for sustaining high unit loads without premature fatigue failure. This treatment reduces residual austenite to a minimum. If highly alloyed steels given this treatment still show evidence of too much retained austenite, an intermediate temper at 1150 F. between the two hardening treatments acts to diffuse and precipitate the carbon inward. Austenite retention is thereby reduced.

Direct Quenching

The term "direct quenching" implies quenching directly from the carburizing medium into brine, water, oil or liquid salt. Effect of direct quenching is often modified by a deliberate time delay before quenching or by reducing the temperature somewhat at the end of the carburizing cycle. A temperature drop-off to around 1500 F. may be used to reduce distortion or retard formation of retained austenite.

Extensive use is made of direct quenching, in order to maintain minimum distortion, as compared to single or double reheating treatments. Martempering, a method that involves quenching into hot liquid baths (oil or salt), is performing an outstanding job in hardening applications where distortion must be kept to an absolute minimum.

In pack carburizing, parts may be extracted from the containers upon removal from the furnace and directly quenched, or be placed on jigs, presses or fixtures and quenched. Adhering compound should either be blown or brushed off before quenching. When continuous gas carburizing furnaces are used, the quenching method frequently becomes one of the operations incorporated into the furnace design. In such cases, the tray of work is automatically extracted from the furnace and lowered into the quenching medium. Modern furnaces may even possess further labor-saving features, such as washing and tempering of the parts on the trays, plus burning the carbon from trays or work carriers.

A typical example of a highly mechanized installation in a large automotive plant is illustrated. In this setup a combined charge of ring gears and transmission gears is loaded into the vestibule of a continuous, radiant-tube, gas carburizing furnace. Flow of the work through the different operations is depicted in a diagrammatic sketch. Pieces can either be removed through the discharge doors, as for press quenching of the ring gears, or left on the trays for automatic quenching into a tank alongside the furnace. The design even provides for a martempering hot quench if required, a washing operation, and unloading station if tempering is not specified, and also for a tempering or drawing operation, if required.

Many continuous gas carburizers provide for discharging the tray of work without automatic quenching.

Electro-Alloys

If work is to be quenched direct from a pit carburizer, a cast fixture designed for the product affords maximum furnace loading and controlled quenching conditions

Then, parts are quenched into adjacent tanks either individually or left on the trays to be quenched together, tray and all. In pit-type gas carburizing furnaces, it is not uncommon to quench the entire basket or load of parts simultaneously. However, a large quench tank equipped with good oil agitation and proper fire protection is advocated if this is attempted. Parts also can be spilled or dumped individually into oil from baskets when using pit-type equipment.

When it is undesirable to spill or drop the parts into the quenchant, because nicking and distortion might occur, the pieces are customarily placed in baskets, racks or tiered fixtures. Heat-resisting alloy fixture assemblies up to four tiers high are often used for direct quenching from pit-type carburizers. A fixture such as this favors not only good circulation of the carburizing gas but uniform heating as well and permits rapid even cooling throughout the charge when quenching for hardening.

Liquid salt carburizing installations almost without exception incorporate direct quenching either into brine, water, or oil, or into hot liquid salt or oil baths. However, it is well to remember that hot salt or hot oil quenching tends to increase the mount of retained austenite. For this reason the carbon content of the outer surface layers of the case must be substantially lowered to avoid this condition.

Another installment of "Good Carburizing Practice" will be published in an early number.

Tips FOR TOP SHOP MEN

376 Originality of thought must be forced in many cases. Be careful that you don't help a man with his job to such an extent that you've solved it—thus removing both his originality and his interest.

377 Plan to use older men effectively—on jobs requiring their special skills or for training. For many men the attractiveness of retirement lessens as the square of their distance from it.

HOW QUALITY CONTROL BENEFITS

Inspection insured and costs lowered for handling materials, reworking defectives, and policing material standards, when quality control is considered in layout planning

By R. W. MALLICK
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OLD-STYLE GAGE ROOM is of construction that does not lend itself to installation of atmospheric controls of humidity and temperature. Instruments are mostly physical-contact gages not protected against expansion and contraction as temperaure changes

MODERN GAGE-CONTROL LAB includes precise electro-physical gages protected from abnormal temperature and humidity. Atmosphere control is automatic and standards of measurement can be maintained to extremely close limits of accuracy

CONTROL over quality probably has received greater attention in Metalworking than in any other industry that engages in intermittent manufacture. This stems in part from the early start made by Metalworking in operation analysis, and in part from the rigid specifications that are required when metal parts are machined on a mass-production scale for precision assembly into finished products. In any event, as quality control now is a permanent institution throughout most of the metalworking industries, the plant layout of today no longer can be considered complete without due provision having been made for quality-control facilities.

The factors entering into quality control vary widely. During the preliminary planning of a plant layout, a determination should be made of these factors and of the provisions necessary to satisfy the conditions required for effective quality control. A synopsis of the general provisions to explore in most manufacturing enterprises is given. By investigating these factors closely, the specific provisions to be made in the plant layout usually come to the surface.

Plant Facilities Must Be Good

A major demand on layout is the concept that obtaining quality by re-working material in process is somewhat like locking the door after the horse is out of the barn. This idea is clearly expressed in the slogan of a leading manufacturer: "Quality must be built into a product—it cannot be inspected into it." Normally, it is only through proper planning of the plant facilities and making due provision in the layout for quality control that the quality of materials and products is controlled most efficiently and economically.

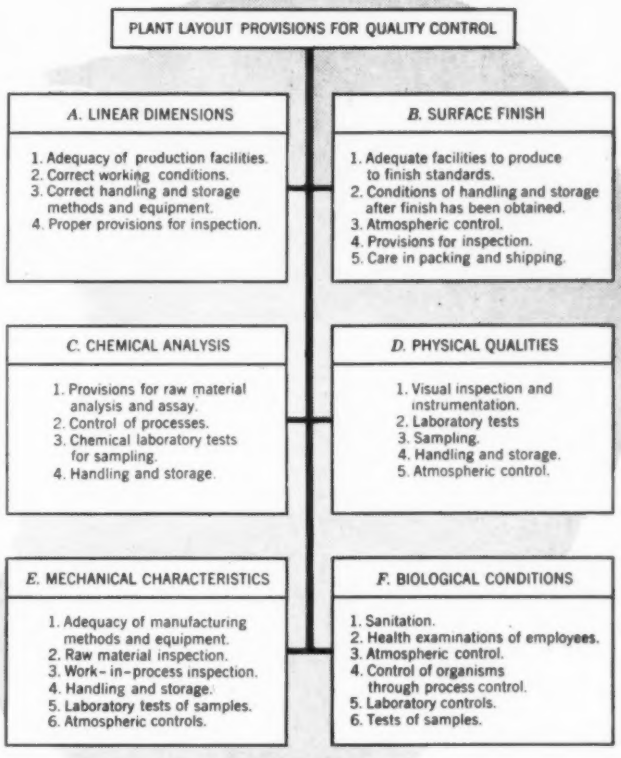
Thus, the majority of layout pro-

Condensed with permission from Chapter XV of Plant Layout, Planning and Practice, *by R. W. Mallick and A. T. Gaudreau, soon to be published by John Wiley & Sons, Inc.*

FROM GOOD PLANT LAYOUT

visions for quality control call for automatic execution of control as an intrinsic part of the process or of the operating conditions, rather than as a series of objective inspections. Preventive measures are employed in an effort to "build quality into the product" and avoid remedial processing after the damage has been done. These include: (1) raw material inspection; (2) suitable handling and storage facilities; (3) modern building structures; (4) good lighting; (5) scientific color schemes in painting the plant; (6) atmospheric control of dust, dirt, heat, and humidity; (7) periodic health examinations of employees; (8) adequate supply of measuring instruments for processes; (9) laboratory testing of samples, and developing of statistical controls. (10) inspection stations located at strategic points along the flow of manufacturing processes; (11) use of test floors; and (12) control over packaging and shipping methods.

Most of these preventive measures require definite provisions to be made in the plant layout. The logical time to make these provisions is while the layout is being designed, and not at a later time as an afterthought, to be squeezed in here and there, after the layout has been developed.


PLANT LAYOUT PROVISIONS FOR QUALITY CONTROL
A. LINEAR DIMENSIONS
1. Adequacy of production facilities.
2. Correct working conditions.
3. Correct handling and storage methods and equipment.
4. Proper provisions for inspection.
B. SURFACE FINISH
1. Adequate facilities to produce to finish standards.
2. Conditions of handling and storage after finish has been obtained.
3. Atmospheric control.
4. Provisions for inspection.
5. Care in packing and shipping.
C. CHEMICAL ANALYSIS
1. Provisions for raw material analysis and assay.
2. Control of processes.
3. Chemical laboratory tests for sampling.
4. Handling and storage.
D. PHYSICAL QUALITIES
1. Visual inspection and instrumentation.
2. Laboratory tests
3. Sampling.
4. Handling and storage.
5. Atmospheric control.
E. MECHANICAL CHARACTERISTICS
1. Adequacy of manufacturing methods and equipment.
2. Raw material inspection.
3. Work-in-process inspection.
4. Handling and storage.
5. Laboratory tests of samples.
6. Atmospheric controls.
F. BIOLOGICAL CONDITIONS
1. Sanitation.
2. Health examinations of employees.
3. Atmospheric control.
4. Control of organisms through process control.
5. Laboratory controls.
6. Tests of samples.

CHECKLIST of general provisions aids in determining specific quality-control needs in any plant layout. Points should be explored during preliminary layout planning to insure that layout provides conditions for effective control of quality

Receiving-Inspection Layout

The starting point in quality control normally is in the receiving department. The principal prerequisites for quality control in this area usually include three major points: (1) It is essential that the receiving department be so located that all materials and purchased parts pass through this department. (2) The receiving area should be fully enclosed and separated from the flow in the rest of the plant to prevent the material from reaching the plant or storage areas until it has been properly inspected. The receiving department thus becomes a receiving-inspection area. (3) As all material must pass through the receiving-inspection area, the layout in this area must provide for efficient and expeditious movement of materials. Normally, material should pass through this area, from receipt to delivery, within one working day.

All defective or rejected material or parts should be placed in a quarantine area until proper disposition has been made. Quarantine should be adjacent to, but not part of, the receiving-inspection area. Thus, the over-all receiving and inspection area should be made up of three separate components: the receiving department, the receiving-inspection area, and the quarantine area. Adequate floor space and suitable equipment should be allocated for these areas at the time the layout is developed.

Planning Modern Gage Rooms

Gage rooms in metalworking industries have undergone considerable modernization in late years. The old-type gage room had but one distinctive feature—isolation. It had no protection from

INSPECTION STATION in production line is properly planned and well laid out in machining department it serves. It is equipped with jib crane and is served by overhead crane. Fluorescent fixtures may be pivoted out of way when parts are lifted on or off tables

vibration, heat, cold, humidity, dust, or dirt. Furthermore, it contained little or no provision for accurate linear measurement.

In the modern gage laboratory, completely-controlled atmospheric conditions are attainable. Temperature and humidity are kept constant and air pressure is kept slightly on the positive side, thereby causing an outward flow of air and providing a supply of clean air at all times. Walls are of salt-glazed tile, and the floor covered with asphalt tile. The ceiling is of sound-deadening material. Many plants have discovered that laboratory rooms constructed along these lines are not an extravagance.

Reduce Damage In Handling

Close attention must be given to the selection of proper manufacturing and handling facilities. The layout can contribute directly to attainment of high uniform quality by making adequate provision to avoid damage to machined surfaces during transportation in the plant.

Where conveyors are not feasible, line storage can contribute to product quality in several ways: (1) Line storage eliminates the handling of machined parts into and out of tote pans and boxes, or in piling on skids. This automatically eliminates incidental damage to finished surfaces. (2) Line storage also makes possible the proper "sampling" of lots for inspection and quality evaluation.

Trucks or conveyors for line storage should be chosen with care. The size and quantity of the parts dictate equipment selection. In all cases, the governing factor is protection of the parts.

Inspection In Production

Often, the plant layout engineer plans a layout that is well-nigh perfect for flow of material. Yet, he fails to provide suitable locations for inspection stations. Of course, he seldom is called upon to determine the type and number of quality-control points to be established. These decisions usually are made by the person directly responsible for quality control in production. But, because of the increasing importance of quality control, the plant layout engineer should be familiar with its basic principles.

It is necessary to spot inspection stations so parts can be inspected at a strategic time during the manufacturing cycle, such as after definite operations have been performed. Yet, inspection stations sometimes are omitted and usually the omission is not discovered until production has actually begun. Inspection stations then are hurriedly squeezed into whatever corner happens to be available. Make-shift arrangements of this type increase the cost of handling parts to inspection, cause inspection to be slighted, and result either in quality deteriorating or the cost of control rising unnecessarily.

It is not always desirable, however, to locate inspection stations in the line. For example, later on, it might be desirable to eliminate an inspection after proper control of product quality has been achieved. If the station is in the line and later is discontinued, valuable manufacturing space may be left idle.

Layout of Test Areas

In heavy industries, test floors are indispensable, but their layout and design is a highly specialized task. Although the plant layout engineer should be capable of planning the general arrangement, the detail design should be done by someone thoroughly familiar with the operation of the test equipment. The planning engineer also must know the physical dimensions of the test rigs, as such setups often are intricate and cumbersome.

Good Control Is Not Costly

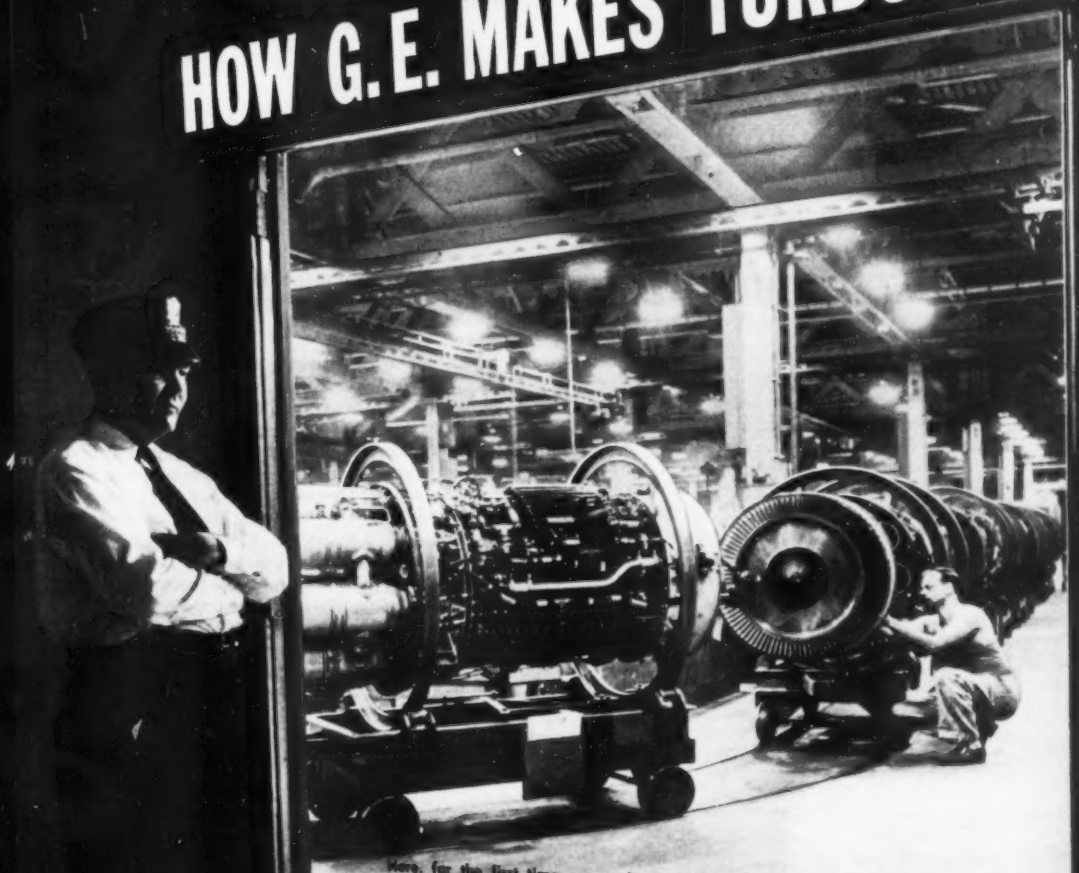
In capturing and holding markets for the finished products of a plant, the quality of the product usually is as important as the selling price. Oftentimes, quality ranks above price in attracting and retaining sales markets. In the layout of a plant, therefore, planning for quality control becomes as important and fundamental as planning for production.

The layout should be so arranged, however, that quality control can be obtained as a by-product of manufacturing activity —that is, at no additional cost over regular production costs. Getting something for nothing these days is undoubtedly as questionable as it is extraordinary, but it is a recognized fact that proper planning will accomplish helpful feats at no added cost over inadequate arrangements of plant facilities.

American Machinist

ARMAMENT REPORT

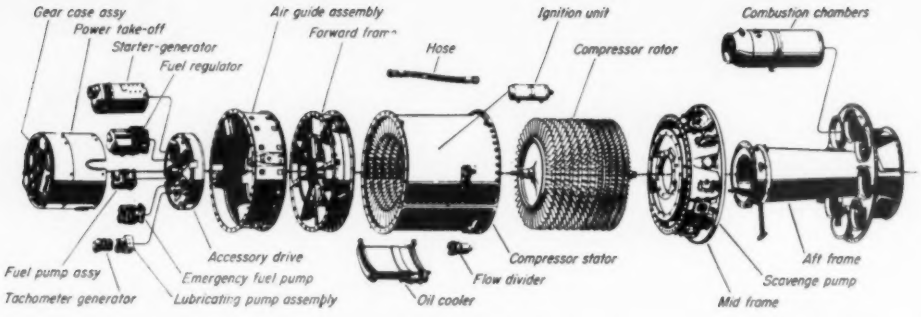
HOW G.E. MAKES TURBOJETS



Here, for the first time, unusual operations in the manufacture of the J-47 turbojet are pictured and described. Production steps are those in the G. E. plants at Lynn and Everett, Mass. General Electric also operates the huge assembly plant at Lockland, Ohio, for which all parts are currently being subcontracted. Our effort here has been to select those steps in the process which represent advanced practice applicable also to other products in other plants. Photographs, with only a few exceptions, were taken especially for this report by Jim Burns.

C. L. TAGGERMAN, Executive Editor

ANDERSON ASHBURN, Associate Editor



BUCKETS AND BLADES

BUCKETS for the turbine and blades and vanes for the compressor section are both hot-forged from stainless steel bar. Stationary nozzle diaphragm vanes for the turbine are hollow precision castings, sub-contracted. All buckets are drophammer forged, but blades and vanes are made by several processes.

Primary problem is to achieve scaleless forging to maintain the close tolerances and profile-finish requirements. To do this, Lynn has a "model" forge shop, amazingly clean, extensively mechanized, and elaborately controlled as to forging temperature and furnace atmosphere. Even incoming stock is segregated by heat to avoid troubles from slight differences in composition or condition.

Buckets, because of their deep profile and relatively larger size, are produced only by drop forging. The process involves four forging cycles; all but the first upset are followed by pickling, sandblast, and inspection operations. Bucket blanks are $\frac{7}{8}$-in. round bar, centerless-ground and abrasive-disk-sawed to length. These are induction heated at one end, then upset to form a bulb that makes the root. To this bulb is flash-welded a smaller-diameter steel stud for a tong-hold (pictured). Buckets are then heated in a controlled-atmosphere furnace and blocked (2000-lb. hammer) quickly to prevent scaling in the die. The blocked blank is sand-blasted, pickled, and inspected. Finish forging follows the same cycle. Then the bucket is heated again, coined hot to exact shape, trimmed (to remove flash and tong-hold), and sent again through the cleaning and inspection cycle. Only finishing is of the root shape and grinding of hot-trimmed edges to remove burrs. Bucket profile is untouched except to buff out surface flaws before hot coining.

Blades, smaller in size, greater in number, and somewhat less critical as far as operational heating is concerned, are made by three processes. Two

Blade and bucket dies for drophammers are hogged out in this double line of 21 Gorton Model 8½ and 9-J manual-control duplicators. All cutters are high-speed steel: ¾-in. end mill and ⅜-in. ball cutter do roughing. Finish cutters have 7° taper for the draft angle and a 0.050-in. ball, with smaller cutters required in some spots. Most dies are now hubbed in drophammers, then require only removal of pressed-up die steel at edges

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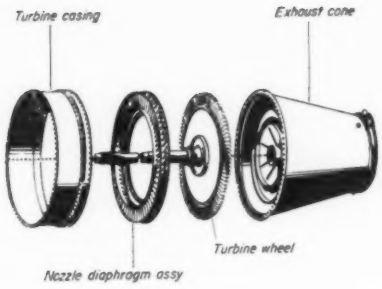


HOW THE J47 WORKS:

Air enters the front (left), passing around the accessory equipment, through the forward frame, and into a 12-stage, axial-flow compressor. High pressure is built up by the compressor. Air passes through the midframe, and into eight combustion chambers, where fuel is injected by atomizers. By burning the fuel the combustion products expand at tremendous velocity through a nozzle diaphragm and turbine wheel. Power from the turbine drives the compressor and, through gear reduction, the accessories. Exhaust from the turbine passes out through the exhaust cone and provides the jet thrust (in excess of 5200 lb) that drives the plane

work from an automatically sheared and gaged blank 1/2 to 9/16 in. in dia, which is swaged down at the blade end (pictured). Then the root end is induction-heated and upset to form a collar of stock inside the tong hold (pictured).

The oldest process is to press-form the rough, then to reheat and finish in a 1000-lb hammer, hot-coin, trim, and finish by sandblasting, pickling and inspection by magnetic as well as visual methods. A low-cost roughing die has been developed for this, made by machining in a root groove and grinding rough concave slots (sketched). Finishing dies may be made, incidentally, either by hogging out or by hubbing.

A shorter process, made possible by availability of 1300-ton mechanical presses, is simply press-forming from an upset blank in a single stroke.

Newest process, still under development, is roll forming. Blanks are squat T's, blanked from 5/16-in. plate without stock waste. These are stacked in a feeder which passes them singly through an induction coil to the rolls. Rolled blades are coined and trimmed like the others.

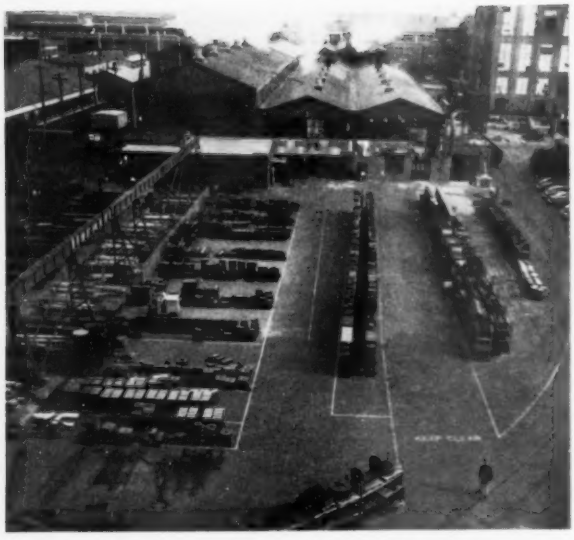
GE has just announced that the Lockland plant will be more than tripled in size and components will be manufactured there as well—presumably by the same methods as those pictured here.

Gaging fixture holds L-shaped gages in sockets relieved in center so they position gages by bearing surfaces on edges only. Locating finger at rear is fenced in in dovetail slot in die. This slot is cut to fit light templets, then hubbed to finished size with heavy templet and brass hammer. It locates die for remaining operations. Adjusting bar at left of die is set to lowest gage when die block is placed and held by locking screw at left. Die is ground down to bring other gages against this bar. Red carbon paper under gages marks high spots which are removed until contour is established under each gaging bar, then contour is blended between lines

Hand-finishing stands in the blade-die room. Hand electric grinders bring dies to finished size. Blade contours are obtained at five critical points by fixture, then blended to hand templet, polished and finally stoned

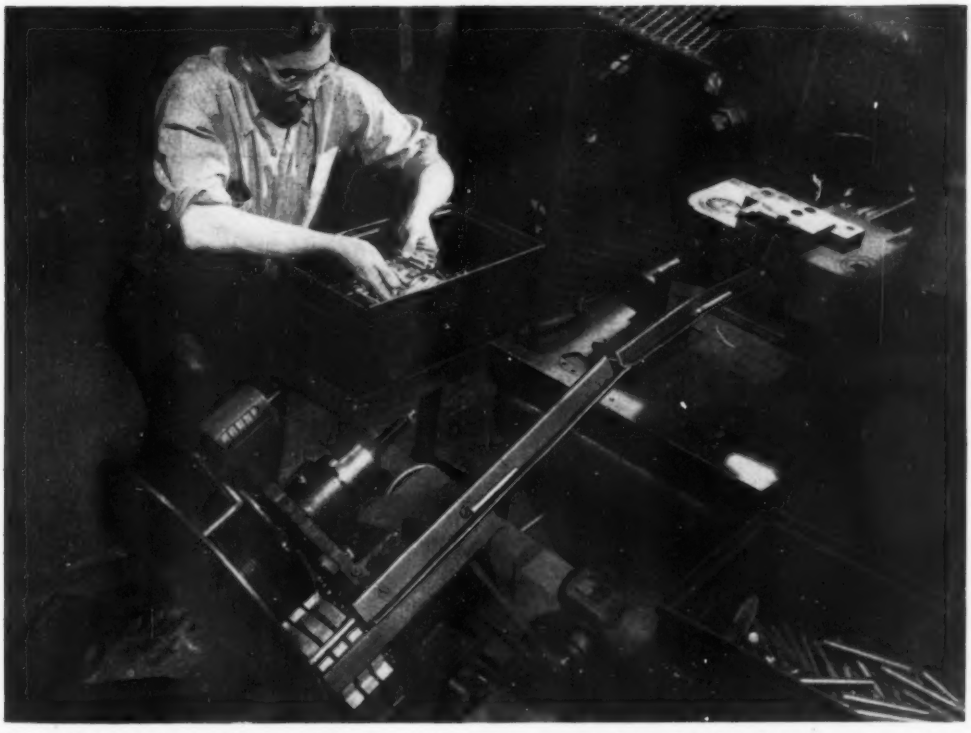
BLADE STOCK IS SHEARED WITHOUT BURR

Comparator in model room (Bausch & Lomb) checks gage for air foil section at 10X. Duplicator models and benching gages are checked in this way frequently to make sure they are still within tolerances. Model room is separate from die room, finishes models, gages, and other checking equipment, working to 10X comparator plates

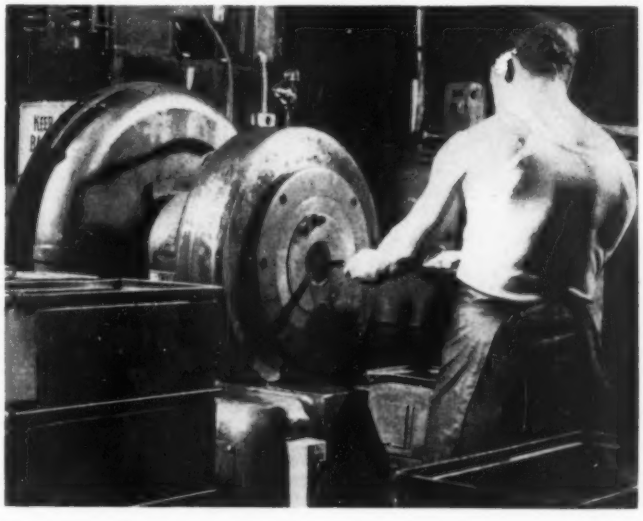


Storage yard at the forging plant. Stock for turbojet parts is kept in carefully isolated piles to avoid mixing with other materials of similar dimensions—even with other heats of the same specification. This is the first step in obtaining close tolerances and scaleless forgings. Blade stock is in the fenced area at left in the photo

To avoid burr, centerless-ground blade stock is sheared in this special circular die. Heavy die blocks are in a massive die holder, the moving section working on 2-in. guide pins. Die blocks have a sliding fit to avoid burr clearances, and stock passes through holes in both dies bored to give as close clearance as possible without pickup or galling. Each hole is 3-in. long for solid bearing, and blocks are changed to suit stock diameter. Press ram strikes movable die section, forces it down against spring action. Cycle: Start button actuates air cylinder (left) on feed carriage, causing feed fingers to grip stock. This trips a Micro-switch which actuates another air cylinder (below stock) to feed stock an adjustable (but exactly set) amount. Feeding trips a second Micro-switch which actuates a third air cylinder to clamp stock in die and trips the press. The cycle is repeated automatically until stop button is pushed or bar end is reached, each feeding ejecting previously sheared piece. Present plans are to make this job entirely automatic

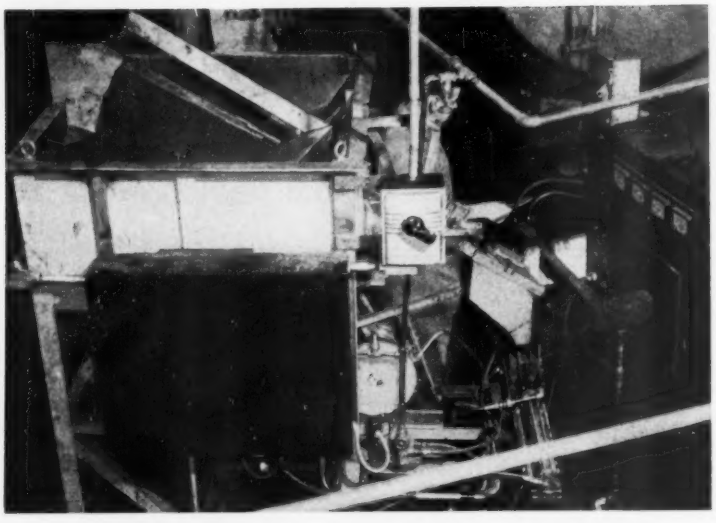


Sheared blade stock is sorted automatically, short or long pieces being rejected. Sheared piece slides down angle-iron V from press die above feeder cam, then to twin sprocket wheels, adjustable for spacing to suit desired blank length, and strikes disk below lower wheel. Short sections (usually bar ends) fall between sprockets at once into scrap box below. Sprocket, driven by chain, picks up cut pieces and carries it forward. This causes an overlong piece to strike block on frame and twist off to fall between wheels into scrap. Thus only proper-length pieces are carried forward to fall into chute leading to blank tote box. Counter shows number of acceptable pieces only

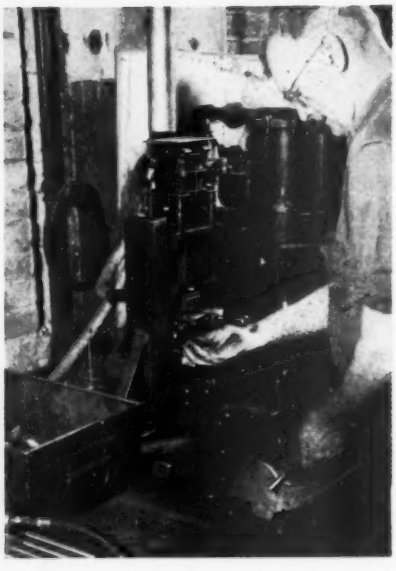


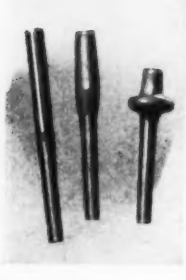
To conserve stock, blade blanks are swaged on the blade section in swagers operating at 3500 blows per min. Type 403 stainless is reduced 1/16 in. per operation in two operations. Even though it cold-workhardens swaging is cold to maintain a clean surface. A very light kerosene-base oil is the lubricant. It was necessary to change the rolls and dies in the machine, converting to a steel similar to 4140, and install heavier mountings, to perform this operation. If dies are exactly aligned, blanks may be hand held; slight misalignment or wear does not damage blanks, but forces operator to use tongs because of vibration and heating

BLADES MAY BE FORGED IN A HAMMER, A PRESS, OR A ROLL



Loading fixture feeds swaged blanks to induction heater before upsetting of the collar. Blanks are dumped into hopper (top left). Reciprocating blades at center catch and lift blanks in channels to a central slide. Blanks travel down the slide either end first, and strike a classifier. This is actually a slot with a movable side, so designed that blanks fall swaged end first onto a curved chute leading to the induction heater (right) into which they are fed by removal of the previous blank

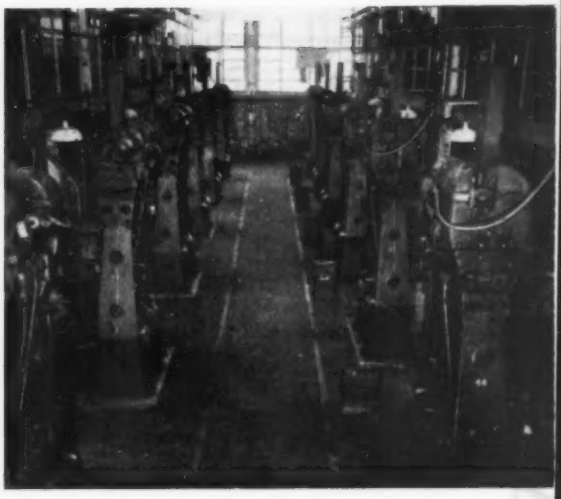




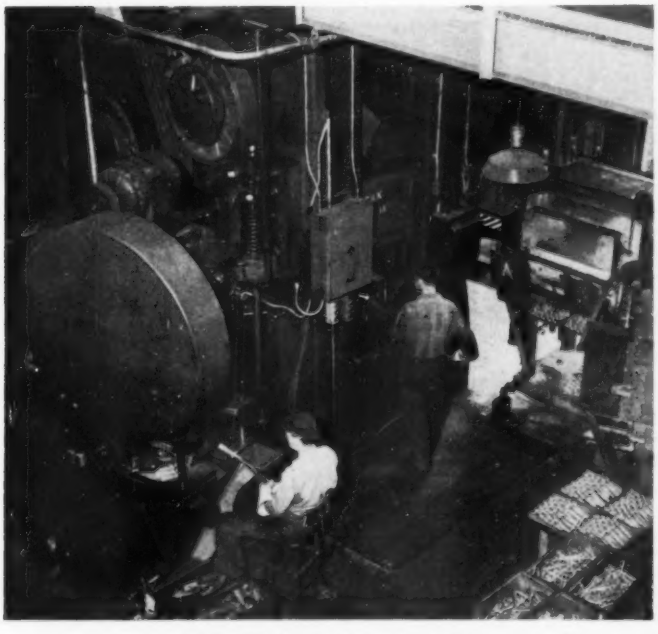
Blade blanks are upset to provide stock for root. Lower die is fixed socket, upper is slidable so two positions are obtained (first shown). Stock varying from ½-in. to 9/16-in. is heated to 2000 F in 3 sec in an induction coil. Operator places blank in water-cooled bottom die and trips Warco 100-ton press. First upset is made in one stroke, then air cylinder actuated by cam on flywheel slides top die forward to bring second die into position for second stroke. Dies are lubricated with oil and graphite. Stock and shapes after each upset are at left

Bucket stock, centerless ground and cut to length by an abrasive disk, is upset in a forging machine. A steel stud for a tong hold is welded above the bulb after upsetting to conserve expensive material. The heat number is stamped on a stud end in air press at right while the stud previously stamped is welded to the bucket blank in an air-cylinder-operated stud welder. A porcelain insulator is placed around the stud to keep metal from flashing out, then is broken off after welding by cracking against the edge of the chute (shown) before the blank is dropped into the chute

Forging hammers for blades and buckets are boxed in on operating side by controlled-atmosphere furnaces. Operator does not have to step away from hammer to reach the furnaces, is separated from aisles and other plant activity by the hammer. Forged blades and buckets are tossed on a chute, slide down into a tote box on the outside of the hammer. This box adjoins an aisle and is easily picked up by a lift truck

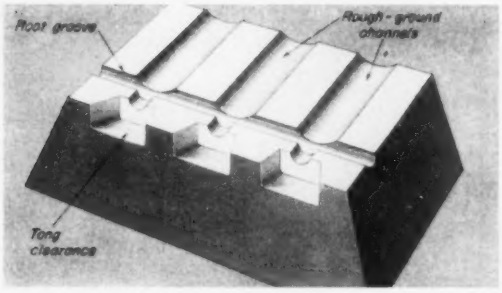


Hammer aisle shows clean condition of forge shop resulting from scaleless forging. To conserve space, electrical controls, indicating pyrometers, and other equipment is placed on balconies. Indicator dials can be read by inspectors from plant aisle to check on temperatures

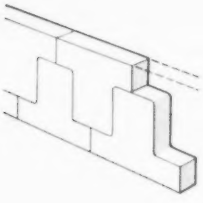


Blades may be forged in Ajax 1300-ton mechanical press in one operation from upset blanks. Two dies are used alternately to avoid overheating. Blades require only trimming after this operation. Operator shows sample while safety lock controls press

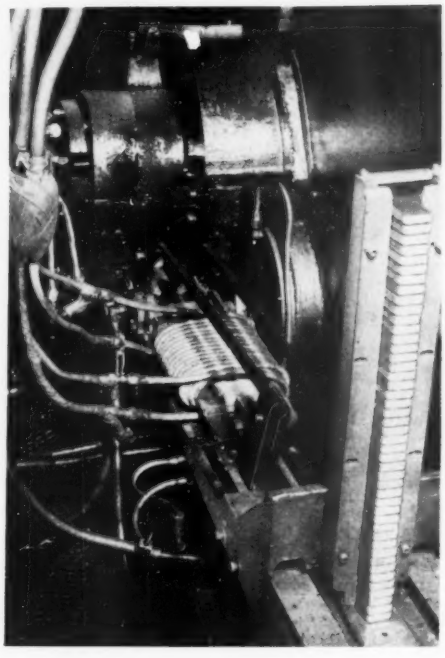
SPECIAL TOOLING PRODUCES VOLUME PRECISION IN FORGING AND INSPECTION

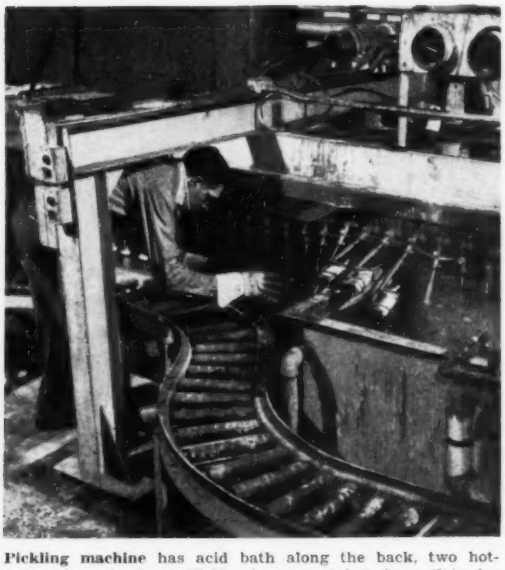


Rough forging may be done in a press with a top die that is flat except for a groove for the root section and space for tongholds. Lower die (sketch above) also has three to seven concave impressions (depending on blade size) simply ground in. These blades are finish forged in a hammer, then hot coined and trimmed



Roll forging from T-shaped blanks eliminates forging operations on the smallest blades. Blanks cut from plate without waste (sketch left) are stacked in a feeder, pass through an induction coil, then through a National Reduceroll (right). Blades are then ready for coining and trimming



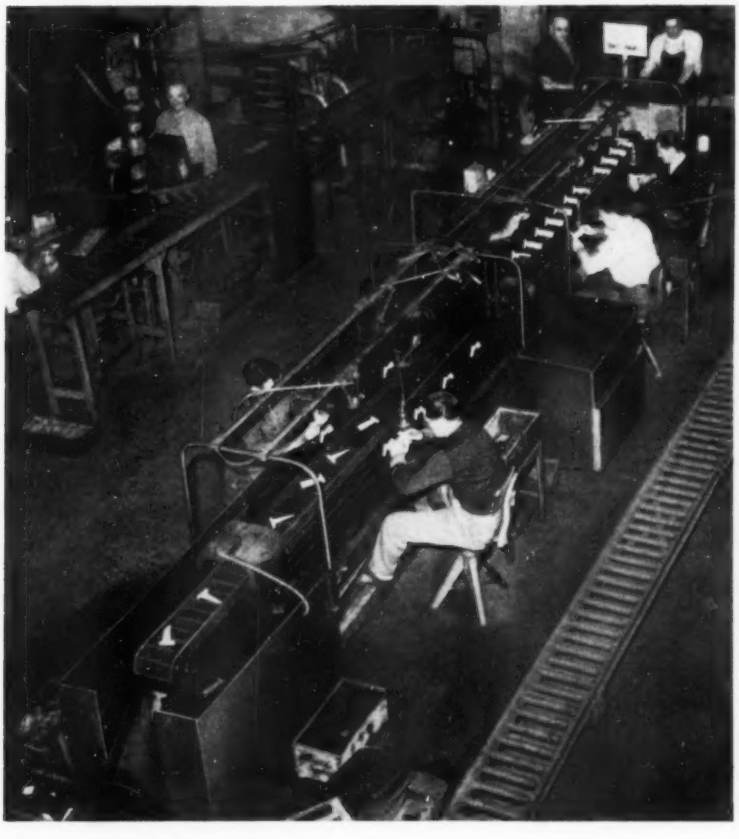


Pickling machine has acid bath along the back, two hot-water rinses in front. Holder has a tantalum base plate for electrical contact and a natural-rubber cover over the rest. One opeator loads and unloads holders as they pass in front of him. Blades and buckets are pickled, sandblasted, and inspected after each forging operation and after hot coining—essential to maintain tolerances and avoid scale

Both ends of the root section are ground simultaneously for Rockwell test in this Gardner grinder with two wheels. Bulb section locates in a slot in the fixture, and side of blade locates against a pin, then air-cylinder-operated lever clamps blade. Fixture rocks forward between wheels

Two hardness tests are made on one end of blade root. Rockwell tester is mounted on bench with three holes at right from which chutes lead to tote boxes. Hole nearest tester is for good blades, next for those too soft, and next for those too hard. A butterfly on each chute trips a solenoid to actuate the appropriate counter. Blades which fail are re-heat-treated

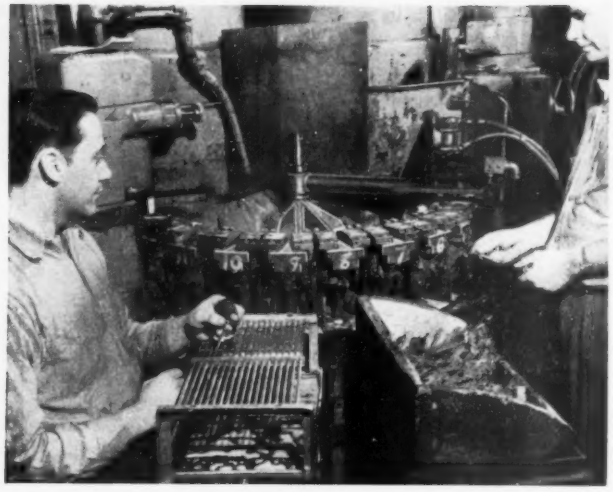
Relation of dovetail to bucket and contours is checked in this fixture. Contour check is by light with feeler gages if necessary. Contours are marked with pencil and thickness along them checked with special deep-throat micrometer



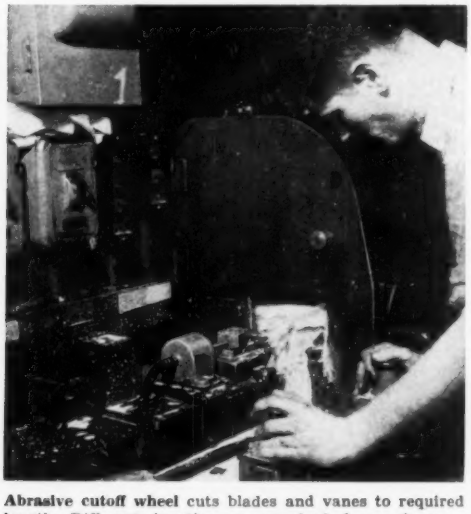
Two Magnaflux tests of every blade are made in special machine which has one operator and six inspectors. Operator loads blades on upper conveyor where they are magnetized in the longitudinal direction and sprayed with oil and iron filings. Inspectors remove blades, circle any defects with red pencil and toss defective blades in tote boxes. Satisfactory blades are placed on lower conveyor by inspectors, are magnetized in the transverse direction, sprayed again. Questionable blades are again removed and marked, satisfactory blades are placed on the upper belt which carries them through demagnetizer and dumps them in a tote box at end of machine. Many defects are surface imperfections which can be buffed out; this is the only surface machining any blade profiles receive

GRINDING IS THE PRINCIPAL BLADE AND VANE FINISHING METHOD

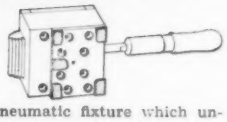
Sides of blade and blade side of root are ground off on this Van Norman Fitchburg. Operator gages thickness of root and angle of blade in inspection fixture within cycle of machine. Thickness is checked by two plugs with offset on top end representing maximum and minimum. If thickness is within limits, low section of plug is below surface of fixture block, high section above it



Vane root is ground flat in Blanchard grinder with special fixture. Blades are placed in fixture which clamps root. Reciprocating arm above fixture at right insures positive location in fixture while clamp is closing. Inner pin fits in V-blocks on inner ring of fixture to cause arm to travel with fixture. Outer pin applies pressure off center to root holding vane against locating pin until clamped. When pins on arm retract, spring returns arm ready to clamp next vane. If arm overtravels, limit switch shuts off machine. Two grinding heads rough and finish grind, removing 0.004 to 0.006 in. Compensator at left rides on finished vane roots, adjusts advance of finish wheel. A second compensator at the back adjusts roughing wheel



Abrasive cutoff wheel cuts blades and vanes to required length. Different lengths are required for each compressor stage. Blades or vanes for two or three stages are forged in the same dies, then cut off to required length. Operator slips blade root between jaws, then actuates machine with two-hand trip. Air cylinder pushes clamp against blade root, locking it against jaws. Second cylinder advances blade to position under wheel. Sections of abrasive wheel are broken out with pliers to make it cut better

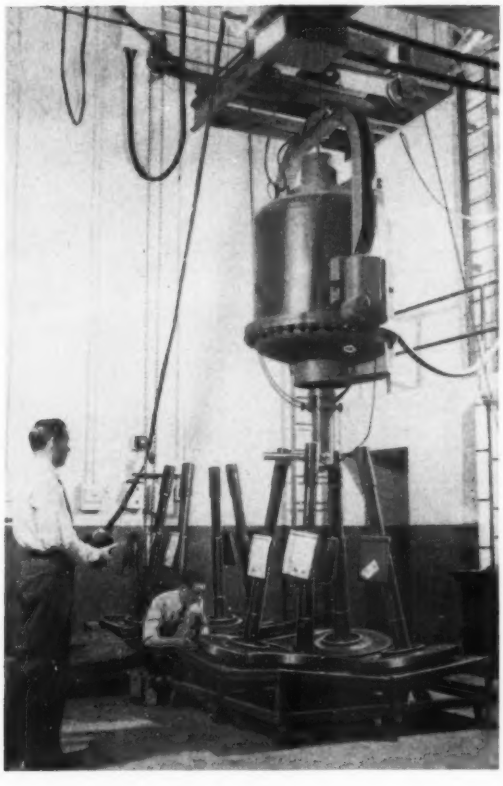


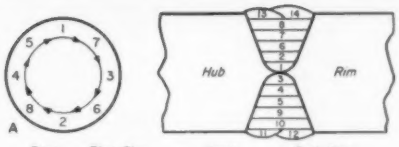
Pinetree form is ground on dovetail of turbine buckets in special Jones & Lamson automatic vertical form grinders. There are two grinding jigs. While one is in machine, operator places other jig in pneumatic fixture which unclamps it for unloading and loading. Bucket locates against hardened button. Carboloy inserts on sides of jig locate in slide of machine. The machine takes ten passes across, with the wheel dressed automatically before the last two

ROTORS AND STATORS

FIRST 9 compressor rotor disks are of aluminum alloy, last 3 are steel, carrying blades in dovetail slots in their rims and shrunk onto a shaft; turbine disks are of steel, forged integral with the turbine shaft, but carrying a shrunk-and-welded rim of Timken alloy into which pinetree-root buckets are inserted. Compressor rotor and stator blades are pressed tightly into slots, stator vanes into dovetails in the stator ring, which in turn slips into a T-groove in the body or housing. Turbine buckets are doweled in place.

Slots of pinetree and dovetail shapes are broached in a single pass per slot, even though the pinetree slot is made in Timken alloy. Roots of buckets are ground to shape, blade roots are broached, again in a single pass. These operations are pictured and described here and on succeeding pages. Welding (shown at right) is a particularly tricky job, requiring specialized technique and careful inspection by X-ray (below).



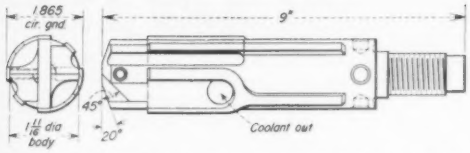


Pass	Elec. Size	Amps	Back Step
1	3/32	120-150	Yes, see A
2-3	5/16	160-185	No
4	1/4	240-280	No

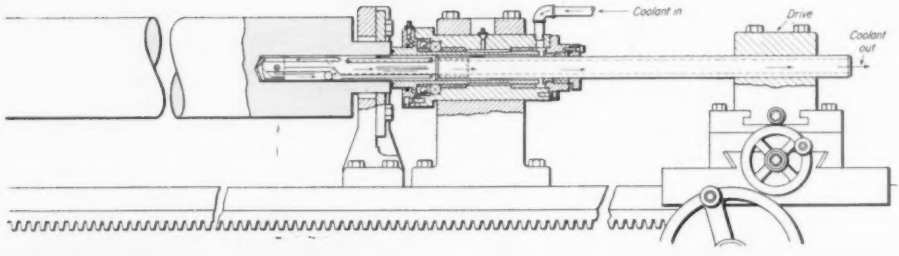
Welding Timken-alloy ring to steel turbine disk provides high-temperature alloy where needed, saves this material through the rest of the disk. Recent saving has been made by reducing ring thickness and increasing disk diameter. The inner diameter of the rim and the outer diameter of the disk are prepared for welding, leaving only a narrow contact band in the center of the cross section. Ring is preheated to 1100 F, disk to 600 to 650 F. They are assembled with a shrink fit as ring cools to disk temperature. Calrod units beneath ring in fixture maintain assembly at 600 to 650 F throughout welding, checkable by pyrometer at upper left. Parts are tacked together, then welded. They are turned as weld is built up, first on one side, then the other (see diagram). Operator welds slowly, with a weaving action, to get penetration. Stainless rods (GE W1312), with a lime coating, provide filler material. Exposed weld areas are chipped and brushed between passes to remove any slag and insure good bonding

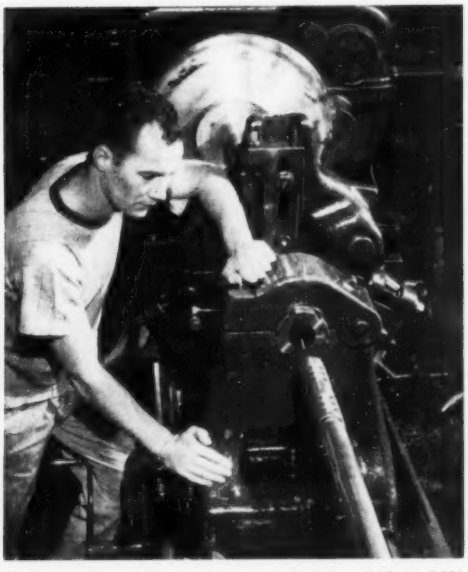
Welds are X-rayed in 1,000,000-volt GE X-ray machine (left). Four turbine disks are placed under head on incline-top, lead-covered dollies that position them so shafts do not interfere with path of X-rays. (Head is normally 10 ft up, was lowered for this picture.) Each disk is marked off in quadrants and film is placed under two opposite quadrants at once, avoiding film overlap. Thus four disks are completely X-rayed in two exposures, providing complete check of weld soundness. Dollies have central threaded collar to which shafts are screwed, are grouped against positioning rails so two setups can be prepared at one time

TURBINE SHAFT AND DISK, AN INTEGRAL FORGING, MUST BE THROUGH-BORED

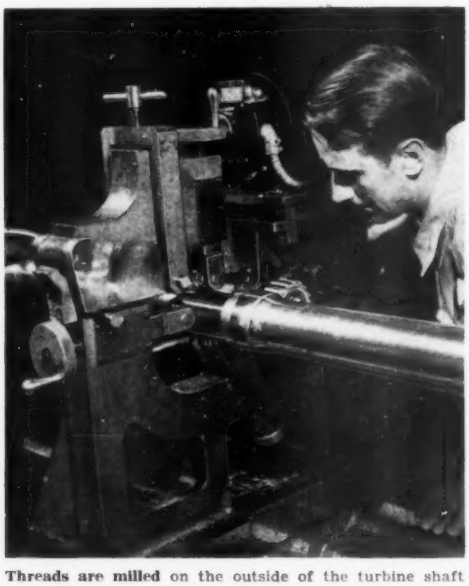


Drilling steel turbine shaft, (left) which is 57 in. long. A 1 7/8-in. hole is drilled 50 3/8 in. deep, then a 1¼-in. hole through. The two are blended with a 15° angle and one end centered. Shaft is rotated at 103 rpm in a 36-in. American lathe. The gun drill (above) with chip-breaker grooves is advanced 0.008 ipr. Sketch below shows method of oil flow. Shaft contour outside is turned on American or Monarch duplicating lathes

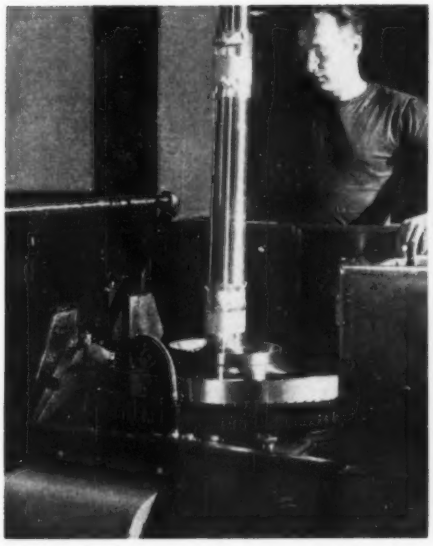




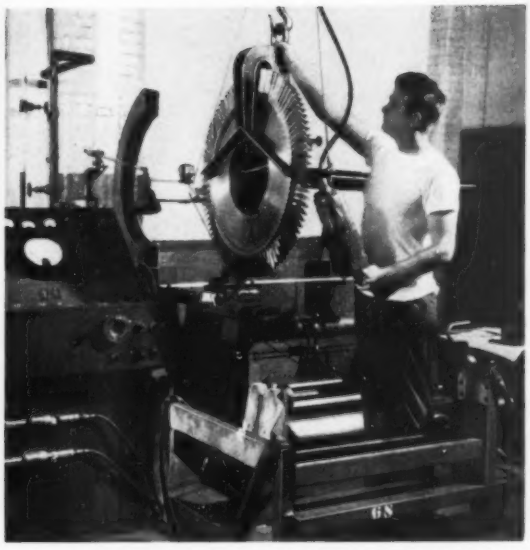
Pack reaming of the 1¾-in. hole in turbine shaft to 1.990 in. holds runout to 0.002 to 0.003 in. for entire length of shaft(see **AM** Aug. 7, 1950, p 95). Two blocks of maple fitted into reamer shaft (0.004 in. oversize) are compressed in guide bushing until reamer is guided into bore, then guide in reamed portion of bore. Reamer blades are of Carboloy. Rough ream is at 199 rpm with 0.008-ipr feed, finish ream is 289 rpm with 0.012-ipr feed. Blocks are replaced at the start of each shift. Finish must be held to 63 microinches rms after finish reaming and 16 microinches after honing (which is not done until all other operations on disk and shaft are completed). Actually, honed finish is coming out about 8 microinches rms



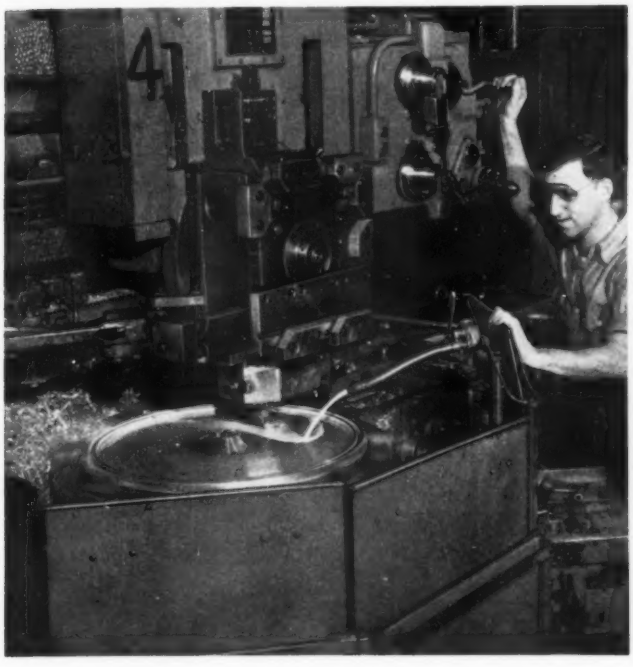
Threads are milled on the outside of the turbine shaft with special geared head on toolpost of a 36-in. lathe. They are milled in one revolution of the shaft, which takes 7½ min. The cutter operates at 120 rpm and is driven by a separate motor through a gear reducer, both mounted on the lathe carriage. The oil groove is cut on the same machine by changing the cutter and shifting the carriage



Pinetree slots are broached in turbine disk in a single pass. Basic slot, then pinetree form were originally broached separately. For contrast, present broaching time is ⅛ that of the process originally used. Major part of the 84-in. HSS broach cuts the slot, last few teeth cut the pinetree. Broach travels at 32 fpm. wheel is set at slight angle desired for root "lead"

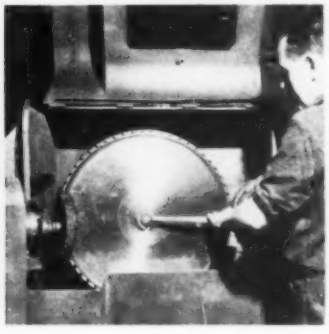


Crane handler is designed to hold turbine shaft and disk horizontally. Dolly cradles it, also horizontally, and has a cap that snaps in place over shaft to hold it on dolly. Rubber protective cover is placed over buckets between operations. Turbine wheels are balanced as final step in Gisholt Dynetric Balancer. Similar special handling devices simplify handling through all processes

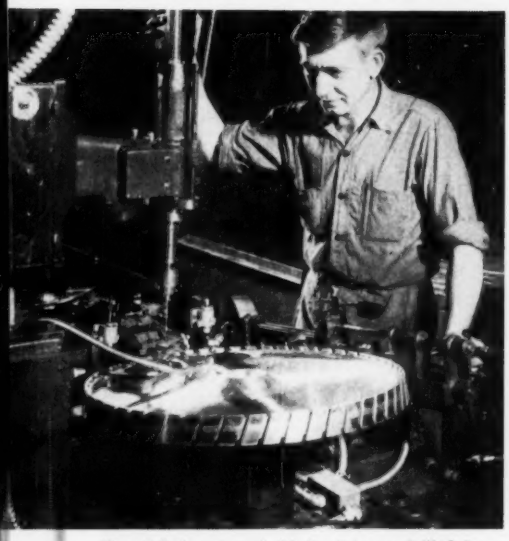


Aluminum rotors for compressor are turned in Bullard Man-Au-Trol lathes. Two heads are used in automatic cycle. One faces hub and cuts groove inside rim (where spacer rings will fit in assembly), the other cuts the contour of the rotor which has compound taper from hub to rim. Speed is 183 rpm and feed 0.010 ipr

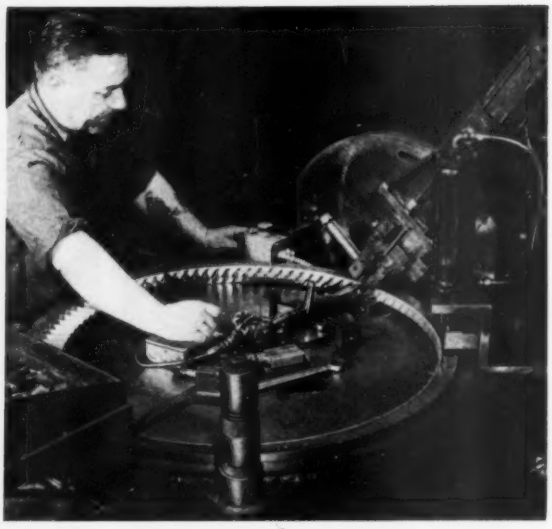
Deburring of rotor is required after broaching of blade slots (**AM**, Feb. 24, 1949, p77). Rotor is mounted in machine, rotated first one way, then the other, as wire brush on each side removes burrs



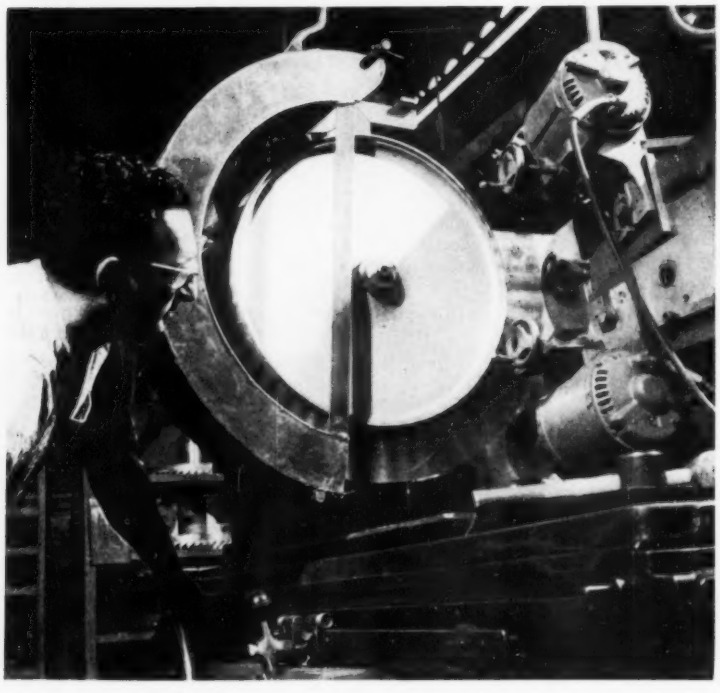
HEAT AND COLD WORK TOGETHER TO ASSEMBLE ROTORS



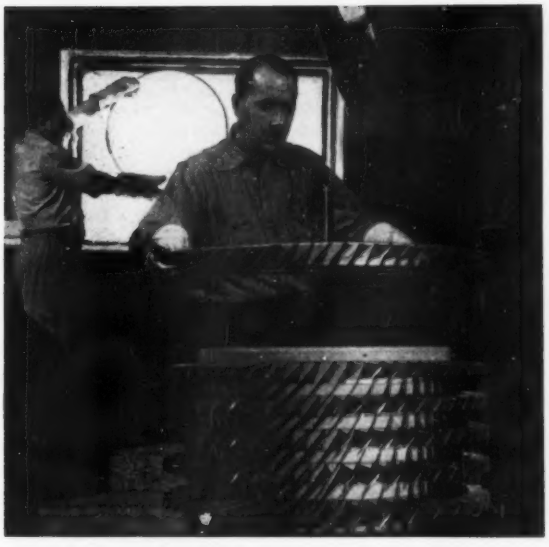
Dowel holes at each blade slot are drilled in Leland-Gifford with special fixture and automatic cycle. Rotor is mounted in fixture and indexed by air cylinder at right operating a pin that catches in broached blade slots. Final positioning is by a second pin at the slot where the hole is drilled. Air clamps on each side of the slot hold rotor firmly against pads during drilling of the dowel holes



Vanes are inserted in stator rings in special fixture with plunger that presses vanes, one at a time, into dovetail slots. (Vanes and blades, in the J47, are identical in contour and root dovetail.) Assembled ring goes into dovetail slot in housing, which holds vanes without doweling. Pressure cylinder is adjustable for any vane angle, and a second air cylinder clamps ring during operation



Tips of blades are ground to length after mounting in rotor and keying in place with dowel pins. Landis grinder is adapted with special fixture to revolve rotor as table traverses in front of wheel. Two wire brushes, driven independently, and rotating in opposite directions, remove the grinding burr. If blade ends need additional grinding for repair after compressor is assembled, the compressor is mounted in a Sydney lathe (also used to finish-turn shaft ends) and ground by a Dumore grinder mounted on the carriage

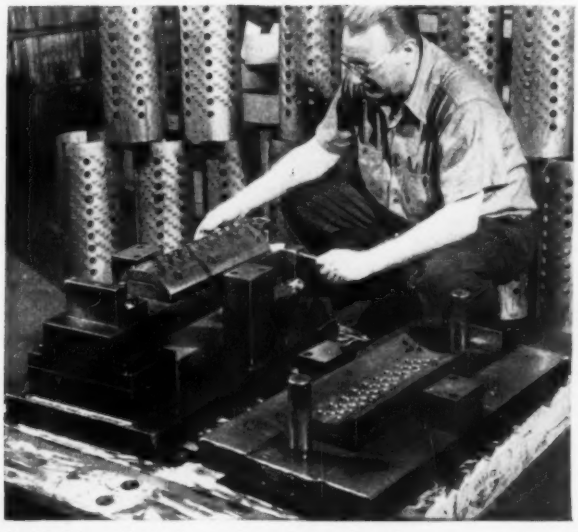


Shrink and expansion fits are both required in assembly of compressor. Aluminum rotors are heated to more than 300 F and form a shrink fit over the compressor shaft and a flange on aluminum ring separating the compressor stages. When rotor has cooled to room temperature, dowel holes are drilled through rotor into ring and dowel pins driven in. The next ring, cooled to -100F in Deepfreeze (being loaded in background), is placed inside flange on rotor. When this has warmed to room temperature, compound seals the ring to rotor and the assembly is ready for the next compressor-stage rotor. Swinging hydraulic press forces rotors down into position on tapered shaft while they are still hot. Fan in housing shortens both cooling and warming waits

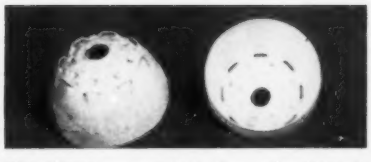
Balanced support for assembled compressor rotor is provided by special crane hook with off-center mounting. Holes in end of crane-hook beam slip over two pins in storage fixture at right (a simple weldment) to provide racks, each holding two rotors, for storage and handling

COMBUSTION CHAMBERS
TURBINE CASING
EXHAUST CONE

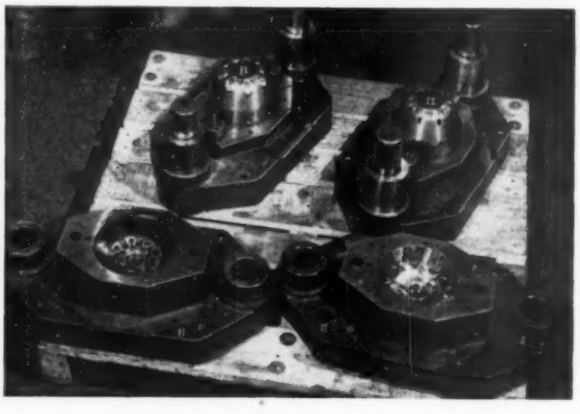
THESE parts are largely Inconel sheet, fabricated in conventional equipment, then spot- and seam-welded into the assembly. Two unusual dies for making combustion-chamber louvers are pictured—an important job because early designs led to stress concentrations and service cracks at the louver corners. Pictured also are fixtures for holding combustion-chamber assemblies for welding and for milling ports in the aft frame.

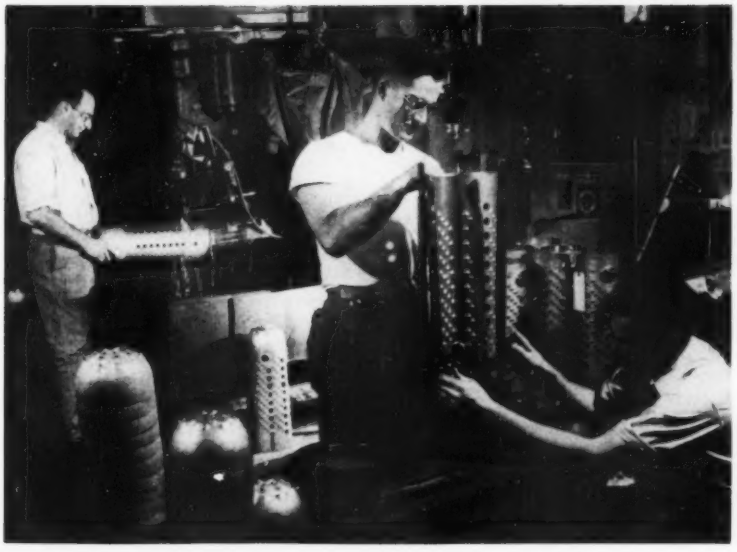


Modified horn die perforates Inconel inner liner for combustion chambers. Although basically a horn type, die has swinging cradle at open end that provides support after liner has been slipped over die. Punches are mounted stationary in lower half of bottom die, upper half is spring mounted, serves as guide and stripper. Punches have Carboloy tips. Chief difficulty was with tearing of Inconel at the base of the perforations, has been eliminated by changes in shape of perforation. Originally only four perforations were punched per operation. Now 32 are made per stroke in a Danly 300-ton mechanical press. With liner rotated on the horn between strokes, only four strokes are required to complete the operation

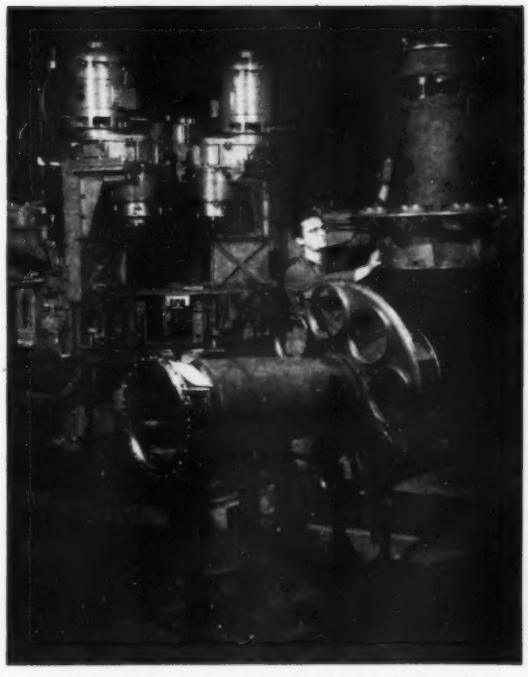


Five stages are required for perforations in cap for combustion chamber liner. Alternate rings of perforations must be punched in and out. Dies for two stages are shown at right

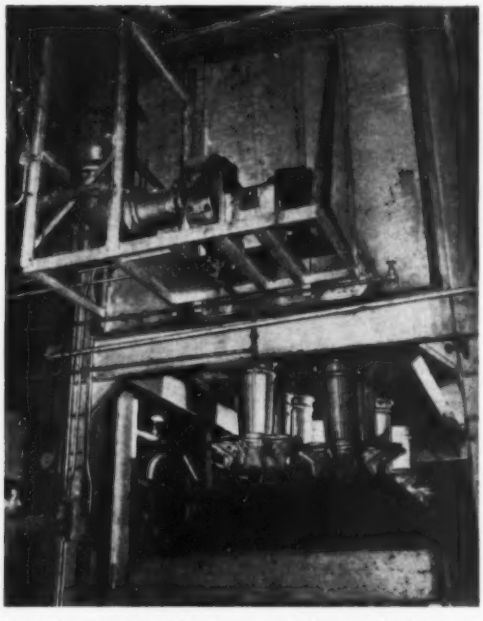




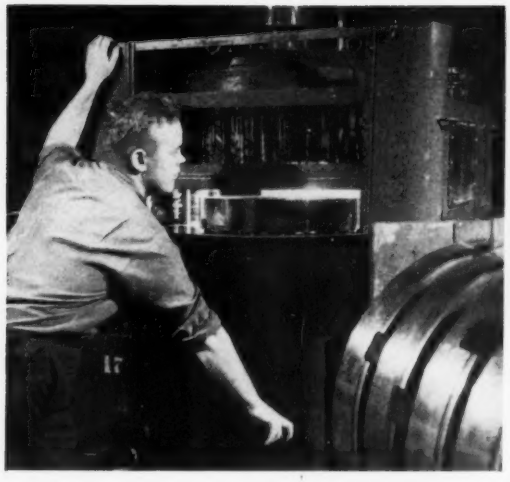
Cap and sleeve are held in special fixture for tacking prior to seam welding. Cap is placed in fixture first, locating over an expanding collet (for locking) and against a pin. Sleeve goes into fixture and is located and clamped by two pins. Top ring is fastened on fixture and pieces are tacked on Taylor-Winfield spot-welder, then removed from fixture for seam welding on machine in background

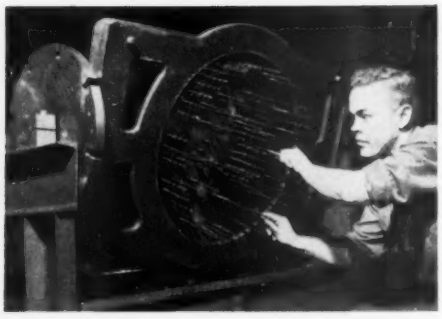


Special milling machine and fixture, both built in Everett toolroom, mill the ID, OD, face, and chamfer of combustion-chamber ports in the aft frame (made from stainless steel). Operations are divided between two milling heads. Fixture holds frame by air clamps and indexes to six positions, controlled from operator's station at the rear of the machine to complete these operations



Welds in assembled aft frames (stainless and Inconel) are normalized in a car furnace, several assemblies being handled at once. Normalizing and cooling is done in controlled-atmosphere furnace, following a closely controlled cycle which increases temperature by increments to the maximum. After two to four hours at this maximum, cooling is accomplished by reducing temperature by increments. Entire cycle takes several hours





97 holes are drilled in the magnesium-alloy accessory gear case (left) in one operation with Zagar drillhead. The machine mounts a different head for similar drilling of the cover. Storage fixture (above) for drillheads has rollover trunnions, lockable at each quadrant, for changing drills or other servicing, and a flat storage rack behind for the extra head. Drawers beneath hold tools, eyebolts, crane hook

FINAL ASSEMBLY

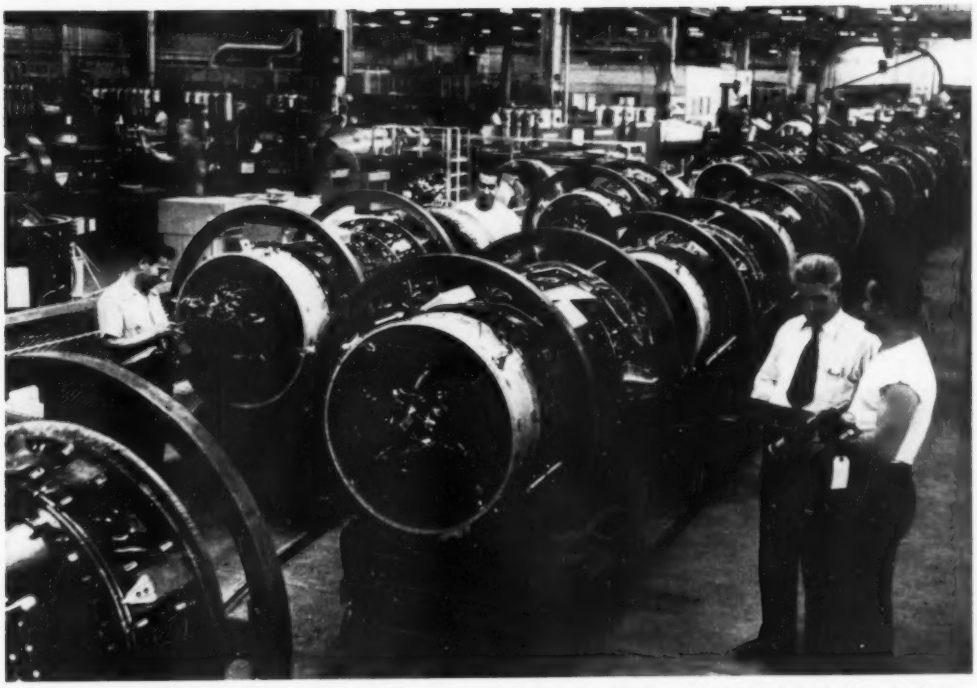
"Snake Pit"—the accessory section at the front of the turbojet—is assembled on the accessory gear case. Rolling table is loaded in the stockroom with all parts for one turbine except fittings and fastening devices. Each part, placed in a compartment of the table, is assigned to a particular turbine. Thus should any part fail in service, it is possible to locate all other turbines containing parts from the same lot so they can be grounded until the part is replaced. Table is moved to the subassembly area in the green line. Fittings and fastening devices are available in cabinets flanking the rolling assembly table

ENGINES are first assembled for the "green" run, tested, then torn down for inspection and check before final assembly. Lines follow the usual arrangement: short subassembly lines feeding into the final-assembly line at right angles. Unconventional, however, is the fact that part stocks are held in stores in line with the sub-assembly line for which each is intended, that several models are assembled on the same line, and that special stands have been built to pretest for oil leaks.

Originally, stores were grouped by number, as in the usual storeroom, but line arrangement was found more efficient. They are delivered to assembly in wheeled carriers with trays for small parts, special racks for larger parts, etc. This makes it possible to produce varying models without confusion, as in automotive practice.

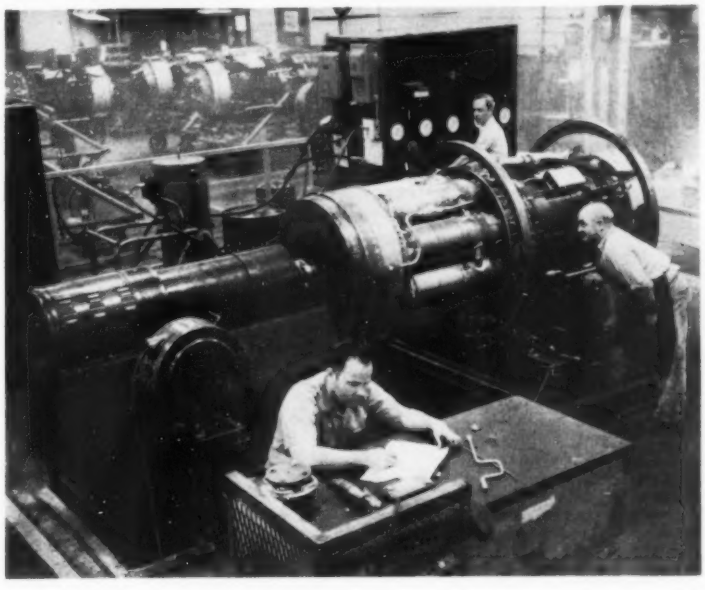
The "green" line in the assembly zone is long and double-tracked, one track for return of assembly cars, with each frame carried in rings on a narrow-gage car. When the base engine is assembled, less exhaust cone, the engine, in its rings, is lifted off the car and set into a raised leak test stand, while fluid is pumped through the lube and fuel systems. Elaborate gage equipment is provided. This test is extremely important, because leakage can cause expensive delay later in the test cell. Originally, small bits of blotting paper were used to check suspected leaks, but visual examination was found just as accurate.

After the test run, the engine is returned to an assembly car, and disassembled on a U-shaped line in the order opposite to that in which it was assembled. Across this line are tables and aisles, one for each subassembly. While the engine frame goes around the U, the parts cross it. All are subjected to both G.E. and Air Force inspection, then are mated again, the engine given a second oil test, and moved into a test cell for a final run. After final test, engines are checked for corrosion protection and packed for shipment.

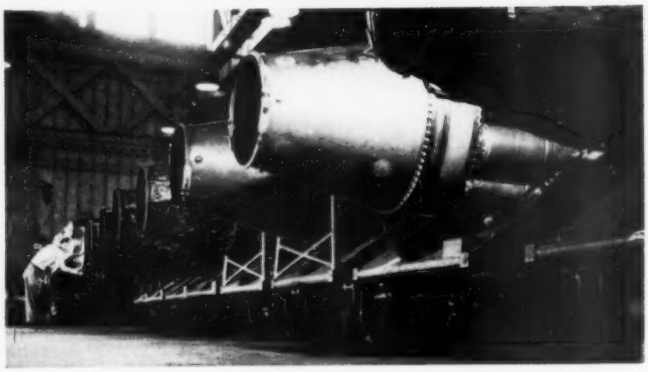


Green line is where turbines are first assembled. Frame is carried in rings on railcar, so it can be spotted for each operation and moved easily to test cells. Stockroom runs along side of assembly area with parts stocked opposite the point they are needed in assembly. Subassemblies are made by assigning parts to engines in the stockroom, placing parts for one subassembly in one rolling table, then moving it to the assembly area. In most cases, unlike the assembly of the "snake pit," even fastening devices are placed in the tables in the stockroom

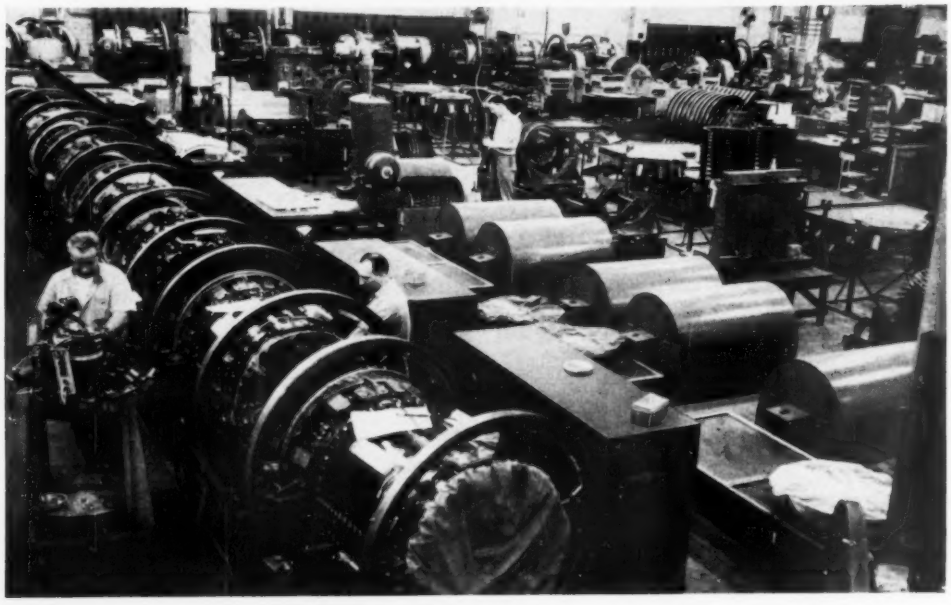
Leak test of assembled engine is made before green run. Because oil leaks are a serious hazard in turbojet operation, engine is mounted in a stand and driven externally by electric motor. Surface of unit is wiped free of oil and inspection made for oil leaks. Originally, small squares of pink blotting paper served to soak up and reveal any leaking oil. Later it was found that straight visual inspection was adequate. Regular leak-test stand is on platform so car can pass underneath. Stand shown here is normally for slushing, is serving temporarily for leak test while regular stands are remodeled to speed operation. They will be enclosed with curtains with ultraviolet light in the booths, and a fluorescent additive in the circulating oil. Thus it is unnecessary to clean process or other oil from the outside of turbine. Oil leaks will be brilliant yellow under ultraviolet light

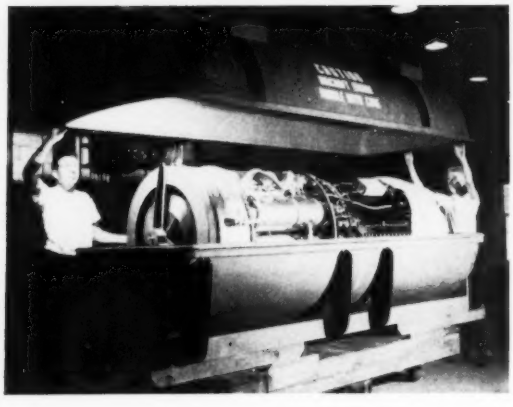


TEARDOWN, INSPECTION AND REASSEMBLY FOLLOW GREEN RUN



Ready for green run, exhaust cover and many other exposed parts are covered with aluminum foil. Temperatures are higher in static test than in operation and the foil reduces the chance of parts cracking from excessive heat





Turbojet is torn down after green run. Turbines move along a long U-shaped line. Major assemblies are removed along the right arm of the U, are inspected as they move across the various inspection lines in the center, and are reassembled in the same unit as it moves up the left arm of the U. At any given time, all parts of one unit are in a straight line parallel to the arms of the U, as they move across the various inspection lines. Plastic covers or special bins protect each subassembly while it is removed from the turbine. After teardown, inspection, and reassembly, turbojets are given a second and final test run

Reusable shipping container is lighter and stronger than former packing cases, will float. Turbojet is mounted to can at three points. Filled with dehydrated air to a positive pressure of 5 psi, and sealed, the can reduces danger of corrosion or damage in shipping and storage

ROUND TABLE

Off Again, On Again

"I see where you let the new man go that came in yesterday, Ed. What's the matter—no good?"

"That's what I decided after he busted that master spring tool we made up to finish the form tools for worm-gear blanks. Now we'll be held up for a couple of days."

"It's too bad about the spring tool, but I'm not so sure that you should have let the fellow go," frowned Al. "You know accidents will happen to anybody."

"But, Al, that tool cost real dough to make; besides, don't you usually judge a man by what he does?"

"Yes and no. There are circumstances in every case."

"Well, what about this case? The man busted a valuable tool. If he was on to his job, it wouldn't have happened," shot back Ed.

"To get to the point, Ed, you shouldn't have entrusted such a valuable tool to an untried man in the first place. You know, a new man always acts like an eager beaver to make a good showing. It may be that the fellow was crowding himself, thinking to get the job out in good time. As a consequence the tool dug in on him."

"And he dug out of here fast because he let it, Al!"

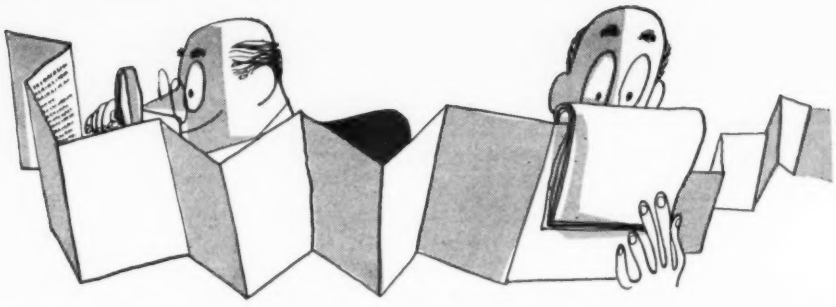
"Yes, that gave you some satisfaction—making him pay for his sin—if it *was* his. I still think you gave him a tough start."

"What do you mean: 'tough'? Either a guy has it, or he hasn't. We might as well find out soon rather than late. You don't have to try all the eggs in a basket to find out if they're bad."

"Well, Ed, I don't think we foremen give enough time to the probationary period to appraise a man's worth to the company properly. I've got a hunch that that fellow will hire out with one of our competitiors and make good."

"Yeah—at breaking another expensive tool. If he is a good man, he wouldn't let the tool dig in."

HOW SHOULD A MAN BE STARTED, *with an easy job or a tough one? Was Ed's action justified? Do shop men expect such summary treatment? Your opinions and ideas on this subject will be appreciated by other readers. Discussions of earlier topics appear on later pages.*



WHAT TO WATCH IN SUB-CONTRACTS

You may save many dollars and headaches if you check these tips — intended primarily for the small-shop owner

BY KARL F. KIRCHHOFER, MANHASSET, N. Y.

SUB-CONTRACTING played an important part in World War II and is destined to assume increasing impetus as prime contractors swing into production to meet the needs of a steadily expanding military machine. For security reasons, prime contractors will spread as much of their work as possible to all sections of the country. Thus, sub-contracting of all kinds will be widespread and will encompass many plants which perhaps have had little or no experience in this work.

Sub-contracts covering defense work fall into three categories: restricted, confidential, and secret. There is also a top-secret classification covering work upon which only a handful of individuals or plants may be engaged.

Restrictions on Information

Before the prime contractor lets sub-contracts on classified work, he requires a secrecy agreement that must be rigidly observed by the sub-contractor. While a thorough study of these clauses requires time, the small-shop owner must be fully aware of what he is signing so he may not inadvertently fail to live up to the letter of the agreement and thus be subject to fines and penalties.

On classified projects, the sub-bidder must not disclose information regarding drawings, specifications, or any facts that might be disclosed in conversations with the prime contractor, to anyone save authorized persons. If he, in turn, farms out work, he may not reveal features of design or construction of the product on which he is working. Thus, although he may issue an order for a screw-machine part which later will become part of an assembly, he may not give out drawings of the completed assembly.

Rules for Employees

Authorities are keenly conscious of subversive activities and watch zealously to guard against this possibility. Thus, the sub-contractor cannot permit any alien in his employ to have access to any drawings, specifications, models, or engineering principles deemed vital to the functioning of the article. He may not permit an employed alien to work on such a contract or on experimental work in connection with these contracts, unless he obtains written consent of proper authorities in the service involved.

Another point that must be watched is the reproduction of blueprints, drawings, or models. This should not be done unless specifically authorized by the contracting officer. Reproductions then must be submitted to the contracting officer for censorship. The government also requires a prompt return of classified drawings or enclosures on which no bid is submitted, or if a bid is made and not accepted, any papers relating to this work must be sent back promptly.

It also is required that various provisions of the law be brought to the attention of persons engaged in the preparation of the bid, as well as any employees who may work on the project. Among these is the Espionage Act, which is a part of secrecy agreements. This states that any person who has possession of, or access to, and is entrusted with material relating to the national defense and who wilfully transmits or attempts to give this to any person not entitled to receive it, or wilfully retains it, may be punished by imprisonment for not more than ten years and may be fined up to $10,000. Negligence or carelessness is no excuse, and anyone who permits the documents relating to national defense to be removed or to be lost or stolen also is liable to these penalties.

Production Schedules

There are certain contract conditions that apply to virtually all purchase orders issued by the prime contractor and the sub-contractor must be fully aware of these terms. When a prime contract has been awarded, the buyer must determine when the farmed-out part will be required and then issue the purchase order, allowing sufficient time for delivery. The subcontractor, once he has agreed to a delivery date, must live up to

the agreement, or be subject to contract penalties. If a work stoppage is threatened, the sub-contractor must keep the buyer fully informed so the latter may obtain the required parts elsewhere or replan his schedule to take these factors into consideration. Do not wait for a strike to occur and then inform the prime contractor.

Generally, on expensive assemblies, or sub-assemblies, the contractor wants exact quantities and reserves the right to return for full credit all goods shipped in excess of the quantity ordered. However, certain contracts may specifically authorize a 5 or 10% over-age, or shortage, on various kinds of production. The purchase order should be amended to allow for reasonable over-age if the nature of the work is such that this may occur. Screw-machine parts, for example, are an item on which a few dozen extra components may be produced on the machine run.

Overtime and Inspection

Prime contractors questioned in gathering the material for this article report that they usually issue three requests for quotations. They then award the order to the plant with the lowest price which also can live up to the delivery needed and can furnish the required quantity and quality. Prices are not subject to increase unless specifically authorized by an amendment to the order. The prime contractor is not interested in the fact that you may have to go to overtime to meet the delivery date. All of these factors should be taken into consideration when the original question is made.

Quality and inspection are important factors in the acceptance of sub-contracted work. Generally, inspection takes place on the premises of the sub-contractor and is conducted by a representative of the branch of the service involved. It then must pass inspection at the plant of the buyer. Defects must be repaired or replaced by the sub-contractor provided he is given notice of the defect within six months of the date the articles are delivered. If the parts are urgently needed, the buyer may rework them in his own plant and pass on the expense to the sub-contractor. The producer also must make available, without cost to the buyer and at his plant, inspection equipment required to inspect the work. Therefore, it is sound practice to maintain an up-to-date inspection department so the work will be practically certain to be accepted after it leaves the sub-contractor's shop.

Material, Tools, and Equipment

All material, tools, and equipment required to fill any order or contract are furnished by the sub-contractor, unless otherwise specified. There are times when the smaller shop may not be able to obtain the particular grade of steel or material required and in these instances the prime contractor may furnish the material. There also are times when the buyer will supply tools and equipment. These must be kept in good condition and held ready for return upon due notice. They should be insured for replacement cost and should not be used for purposes other than the contract involved. The sub-contractor may not duplicate for others, any tools, jigs, or fixtures that have been designed or furnished by the buyer, unless he has the written consent of the buyer.

It is important in all instances to insist upon written instructions. In one purchase form studied by the writer, the prime contractor disclaims any responsibility for verbal or letter orders. Responsibility is assumed only for services rendered or materials furnished as written on the purchase order or actual supplements to the order. Thus, even a letter is not sufficient authorization to make changes. Insist on a purchase-order supplement.

Methods of Payment

In accepting a sub-contract, the small plant should be fully informed as to the financial responsibility of the buyer. Reports can be obtained from established agencies which will give the small-shop owner all the information he needs. Special arrangements for payment and financing of sub-contracts can generally be made with the prime contractor. The small shop, with its limited capital, must watch collections and finances carefully. Few can afford to handle long-term sub-contracts. A workable arrangement is to have the prime contractor inspect the job on your premises, probably weekly or bi-weekly, and then issue payment so you can meet your payroll and material costs.

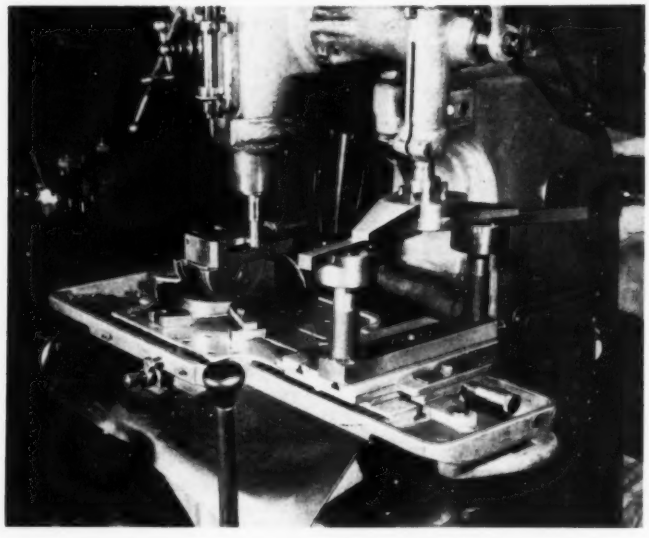
In seeking sub-contracts, the small- and medium-sized shop, should make up a complete facilities list showing all equipment and classes of work that can be done. If available, testimonials from large plants for which parts have been supplied, should accompany the facilities list.

Plant Safeguards

There are other factors, frequently involving considerable expense, that enter into the sub-contracting picture. Security regulations may require the construction of a high, wire fence, the installation of a pass system for employees and the careful screening of visitors and salesmen, the hiring of armed guards, and provision for safeguarding confidential blueprints and documents. Renegotiation of defense-production contracts may be required and it is essential that the sub-contractor establish and maintain records in accordance with government regulations.

The swing toward war production is inevitable. Indications are that events may follow the pattern of the last war, and if you expect to participate in the execution of war contracts, it is essential that you keep fully informed on sub-contracting procedure.

Practical Ideas



Duplicator With Centerless Attachment Machines Extra-Large Curves

THE PROBLEM in machining large curves is establishing a center from which the work or cutter can swing; but when curves are as large in radius as 500 ft, this is impossible with a standard machine. I managed to get around this difficulty by making an attachment for a Gorton duplicator that was handy. The rig was easily adjustable for any curve, yet required no center.

The basis for the idea is the mathematical proposition that the apex of a fixed angle will describe a curve if the legs of the angle are moved through two fixed points. Applying this idea to the attachment: the fixed angle was the angle between two brackets pivoted together, the two legs were long beams — one attached to each bracket, and the fixed points were trunnions fitted in columns in the baseplate of the device.

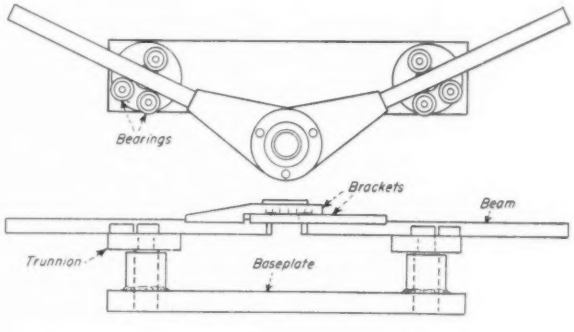
The brackets were actually concentric plates with extensions that held the beams. Index marks and angular graduations marked around the brackets allowed accurate setting of the desired angle.

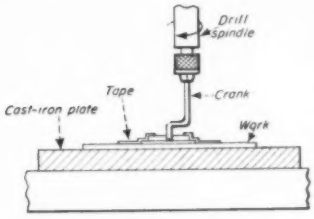
The beams were smooth-milled bars that operated between three staggered ball bearings on top of each trunnion plate. Although the bearings gripped the beams fairly tightly, they allowed reciprocating movement of the beams. Angular rotation of the trunnions was allowed by the plain bearings of the posts, built up from the baseplate.

Installed on the machine, the baseplate was located under the cam-follower spindle so the brackets could be clamped to the spindle. An adapter located the brackets directly under the spindle at all times, but allowed rotation of the bracket assembly. The baseplate was aligned with the table to set the line between the trunnions at right angles to the line between the two spindles of the machine. Thus, as the table fed in, the outer trunnion moved away from the brackets and the inner trunnion moved toward them. At the same time the table describes the curve.

The calculations are a simple matter of trigonometry. The end result, however, is that you divide the distance between centers of the trunnions by the diameter of the desired curve you are machining to get the cosine of half the angle that must be set at the brackets. For purposes of convenience, I marked the angles off from 90° to 180° instead of from 0° to 90°, which automatically took care of doubling the angle to be set on the brackets.

The setup has proven a real timesaver in machining large curves on molds and dies. The length between trunnion centers of the original model was 1 ft, and the attachment allowed machining curves with radii from 6 in. to infinity, and as long as 9 in. *Adolph B. Harvest, Humber Bay, Ont.*





Drillpress Lapping Rig Makes Plates Parallel

MATERIAL was recently supplied us by a larger company for whom we were doing a contract job, along with blueprints. Stock was brass, 5 in. square, and ⅛ in. thick; and although it was in bad shape when we received it, had to be finished parallel and flat within a tenth.

Conventional lapping, which we tried out, did not work because any slight downward pressure distorted the brass and made it impossible to get the two sides exactly parallel. We finally worked out a setup that exerted practically no weight on the brass at all. The setup was made on the table of a slow drillpress with a cast-iron lapping plate in position under the spindle.

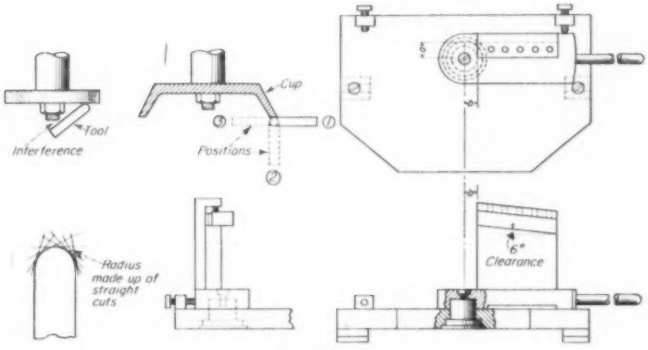
A small brass plate with a ⅜-in. hole in it was held to a piece of brass stock with cellulose tape as illustrated. A small crank was made of drill rod and inserted in the drillpress chuck. Then the spindle was lowered until the crank engaged the hole in the small plate. With the spindle locked in this position and the crank rotating slowly, lapping action was perfect. *Lawrence N. Shustak, Newark, N. J.*

Dividers Indicate For Accurate Drilling

WHEN DRILLING to layout it is easy to line up the spindle of the machine or line up the work under the spindle by chucking a pair of dividers. Almost any type can be used, as long as they are in good repair and are fairly well made.

After the dividers are chucked, line up the work or spindle so one leg can drop directly on an intersecting layout line that indicates the center of the hole to be drilled, and then shift the work or spindle until the other leg will drop on the same line on the opposite side of the intersection. Finally, rotate the dividers 90° and follow the same procedure, only this time shift the work in only one direction.

The dividers can be swung back and forth a couple of times to check alignment. When the dividers are removed and the drill is chucked, the hole should be exactly at the intersection of the two layout lines. *Sidney Gilbert, Bridgeport, Ohio*



Grinding Fixture and Method Produces Accurate Radius Tools

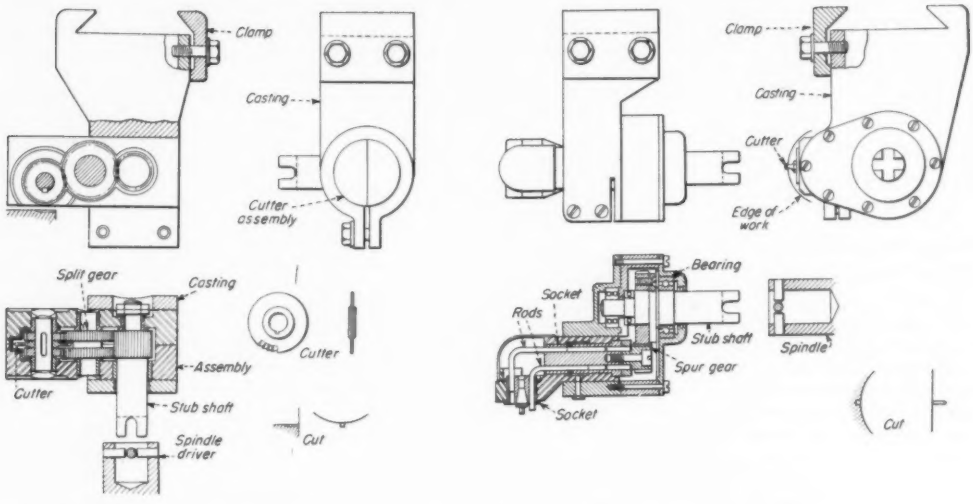
THIS IDEA consists of two parts: a radius-tool fixture that is easy to make, and a method for producing regular curves. Both parts of the system were developed early during the last war for a Naval-instrument manufacturer who used oil-grooving tools.

A fixture similar to the one illustrated was used originally, but it lacked the simplicity and adaptability of this one. The original method had two disadvantages. Radius tools were ground against the side of a regular flat-side wheel, but two passes had to be made because the wheel nut interfered with the blending of the curve on one side of the tool. Making two such passes introduced errors. In addition, working with a fine-grain wheel where there was constant contact with the work ran temperatures up in both work and wheel, which made heavy stock removal impossible.

These two pitfalls were avoided by utilizing a cup wheel, 46 grit, that was dressed with a carbide stick. The fixture is first aligned so the tool is parallel to the face of the wheel. About 40 successive passes are made across the lip of the wheel, with the tool shifted slightly after each pass. Thus, the tool starts at position 1, then goes through all angular positions through 2 to 3, one pass at a time.

With this fixture, such a method is simple and accurate. The tool-holding block is cut so the slot will take the largest toolbit that requires forming, and shims are introduced to space out the smaller ones so they will be clamped exactly on center. The block slot is slanted to allow a clearance angle on the tools. Two stop screws limit rotation of the block at points where the tool will parallel the face of the wheel. Important dimensions are "a", the depth of toolbit slot, and "b", the amount of tool clearance.

Although this method may seem to be slow, it is actually as fast as any other. A ¼-in. radius can be cut on a ½-in. bit in ten minutes, resulting in a smooth finish. *John R. Nick, Whitestone, L. I.*



Two Milling Attachments Produce Blind Keyways

SLOTTING OR BROACHING can be done inside bearing shells when keyways are required, but when the keyways are to go only partly through the bearings, trouble develops in slotting, and broaching is impossible. Two attachments illustrated do this job well for large-quantity production.

The first attachment is for a job that allowed a curve on the end of the keyway—this curve being the same as that of the cutter. The attachment or milling head is clamped to the milling-machine arm, and is aligned so a coupling from the miller's spindle will drive a stub shaft projecting from the head. An iron casting forms the housing of the attachment. To speed lubrication, replacement of the cutter, and repair work, the whole geared assembly can be slipped out of the housing by removing nuts from the back end of the stub shaft, slipping the shaft out of the housing, and pushing the geared assembly out.

Slotting is done with a thin cutter of 36 teeth. This is keyed to a set of gears which are driven by a larger split gear that takes rotation from a gear on the stub shaft. Work is mounted in a fixture on the machine table, and is fed toward the attachment to the depth of cut desired. Although the size of work which the attachment will cut is limited, this disadvantage is overcome by high production requirements, and by the fact that accuracy is excellent and a universal joint is not necessary.

The second attachment is similar to the first, but will handle keyway slotting where a curve on the end of the keyway is not desired. The cutter in this case is a small end mill, which is located in a cone. Rotation through the coupling to the miller spindle is transmitted to a large gear, then to a small spur. To take care of thrust, ball bearings are provided.

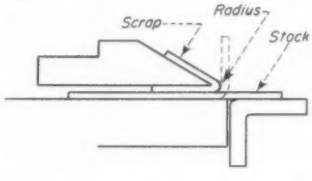
Four round rods, bent at right angles, drive the socket that holds the cutter. To do this, a long socket with four holes equally spaced is attached to the small spur. The four rods revolve about each other, imparting rotation to the socket at the cutter end of the attachment.

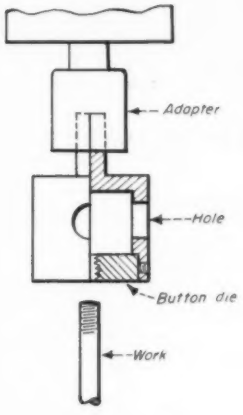
This attachment, too, can be slipped out of the cast-iron housing that holds it to the milling-machine arm. Cutters are easily replaced, and lubrication is simple. *Georges Roseline, La Hulpe, Belgium.*

Brake Adapter Forms Radius Bends

OUR BENDING BRAKE has only a single shoe that produces sharp corner bends. When we occasionally get sheet-metal bending jobs that require various inside radii, we are forced to do some tricky adapting.

First we bend a strip of scrap over the sharp-cornered shoe to form a corner of the required radius, allowing for springback. The thickness of the scrap controls the resulting radius. Then the shoe is set back to clear the added thickness of the shape to be bent and work is bent right over the piece of scrap. *Robert Roedder, Berwyn, Pa.*





Button-Die Holder Flings Chips Away

TO HELP OUT a friend of mine who hit a bottleneck in producing parts for his oil-burner business, I undertook to make 5000 electrodes in my basement.

The main part of the electrode is a 3/16-in. cold-rolled rod, 6 in. long, with a 5/32-in. hole on one end and a 10-32 thread, 5/16 in. long, on the other end. With only a heavy-duty, bench-model drill-press in my basement to work with, the threaded end would have been quite a problem if I had had to do it by hand.

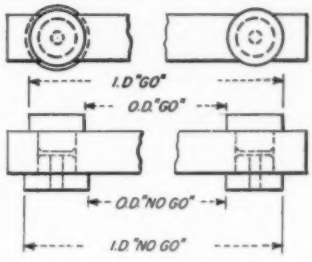
I knew that an automatic tapping head could be attached to my drill to tap stock of this size, so I decided to try making an adaptor to hold a 10-32 button die and to thread the rods in this way. The adaptor fitted in a Jacobs chuck and gripped the button die by means of setscrews. Several large holes were cut in the walls of the adaptor to allow chips to be thrown out by centrifugal force. Work was chucked in a fixture on the table.

This setup actually outproduced my friend's, which was a 9-in. bench-model turret lathe with a regular diehead. I think the reason for this was that his setup was horizontal and chips had to be removed with an air hose after each operation, while mine took care of chips automatically. *William E. Blackham, Dorchester, Mass.*

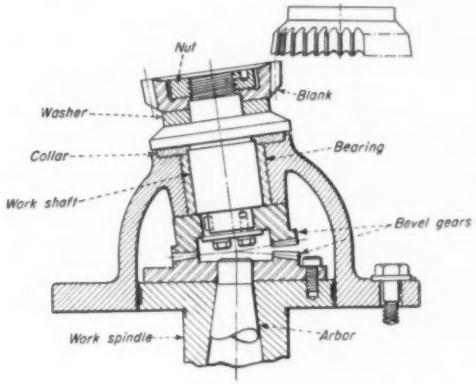
Go, No-Go Gage Made With Buttons and Bar

BOTH GO AND NO-GO sizes for gaging a production job can be provided on a single gage with this design. The bar is a standard steel, and the buttons are hardened and ground pins, shouldered so they will span the gage dimensions, and pressed into holes in the bar.

The job is done on a jig borer, which is necessary to get the hole spacing exact. Larger buttons spanned the no-go distance and the smaller ones the go distance. This can be reversed if the critical dimension variation were undersize instead of oversize.



Often the buttons and spacing between holes will work out to give gage distances for an inside and an outside dimension, if these are fairly close to each other. *H. G. Frommer, Milwaukee, Wis.*



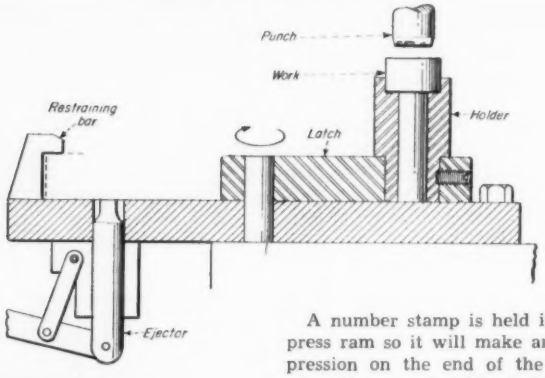
Gear-Hobbing Attachment Roughs Out Pinion Cutters

A STANDARD GEAR SHAPER in our shop can be fitted with a fixture which we think is unique. This attachment allows us to do an efficient roughing job on new pinion-cutter blanks.

The pinion blank is attached by a nut to a slanted shaft that aligns the blank so a suitable side rake will be cut on its teeth. Rotational motion of the pinion blank is transferred from the center arbor of the machine by a pair of bevel gears at a 1:1 ratio. These are skewed at the side-rake angle and have a broad tooth face for maximum life. They are accurately formed for minimum backlash.

The top gear of the coupling drives a secondary shaft that fits closely into a plain phosphorus-bronze bushing in the fixture body. A thrust collar and washer are provided to take the downward force of the pinion cutter in the machine spindle.

With this attachment, we can rough out new pinion cutters with high accuracy so they require only a minimum amount of final tooth grinding. *Nobuo Arakawa, Tokyo, Japan.*



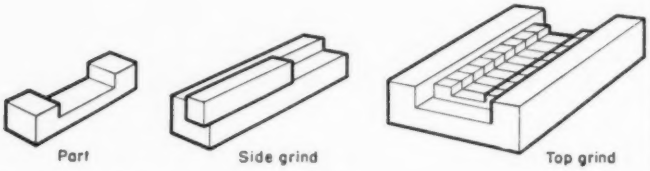
Number-Punch Fixture Has its Own Ejector

IDENTIFICATION NUMBERS are stamped on the ends of workpieces produced in batches on a small eccentric press fitted with a latch.

The base is made of a piece of mild steel, and is fitted to bolt to the press table. The latch itself is made from an aluminum-alloy casting that is drilled to pivot on a large steel pin that projects about 1 in. from the base. Work is held in a round holder that is drilled through and shouldered.

A number stamp is held in the press ram so it will make an impression on the end of the part when the press is tripped. After a power stroke, the latch is rotated by hand to nest under the restraining bar, and a lever ejector is operated to force the workpiece out of the holder. The restraining bar simply holds down the latch to prevent it from rising off the pin.

For good impressions, it is necessary that the ram stroke be carefully adjusted as to length. Minor adjustments can be made by shimming up the holder block. Operated at a slow speed, the press will turn out good parts cheaply. *Ian J. Peacock, Carlisle, England.*



Special Cement Holds Blocks for Grinding

FOR SOME experimental work, I was asked to make a dozen parts like the illustration shows—about 5/16 in. long, with all dimensions held within a tolerance of two tenths. The material was sintered, hard, and brittle, and only slightly magnetic. Grinding could be done with a green wheel made for carbide, used with coolant.

The chucking problem was solved by holding the parts with de Khotinski cement to steel blocks that could be held to a magnetic grinder table. The cement melts at 300 F, so the parts and blocks were wrung together with heated cement between them.

The stepped block shown held each part for grinding length, sides, and top and bottom. The slot in the part was done on a multiple setup in a notched block on the grinder table. The wheel was dressed to grind the whole top surfaces at one time.

Acetone removed the cement. *Robert Roedder, Berwyn, Pa.*

$25 *In addition to regular payment*

for the best PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

116th Winner:

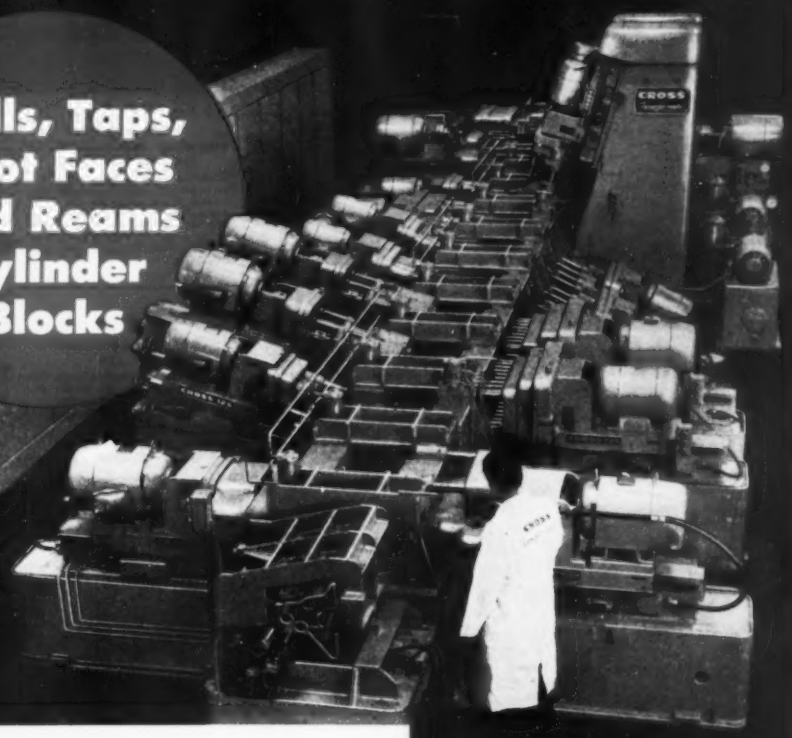
(For October 30 issue)

Allan Clarke

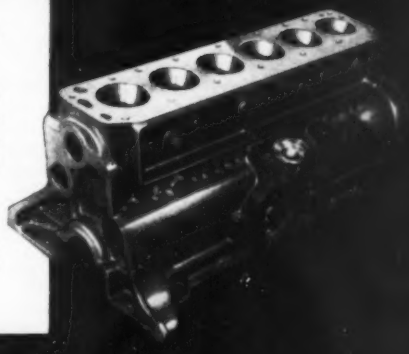
Facing Large Blocks

Another Transfer-matic by Cross

Drills, Taps, Spot Faces and Reams Cylinder Blocks



- ★ 100 cylinder blocks per hour at 100% efficiency.
- ★ 13 stations with automatic transferring.
- ★ Chamfers cylinder bores top and bottom; drills and reams distributor hole and dipstick hole; drills oil holes from main bearings to oil gallery; drills, chamfers and taps head stud holes and pan rail holes.
- ★ Cleaning unit at Station 11 vibrates and rotates part 360° to remove all chips prior to tapping.
- ★ Inspection unit at Station 12 stops machine if holes are not to proper depth.



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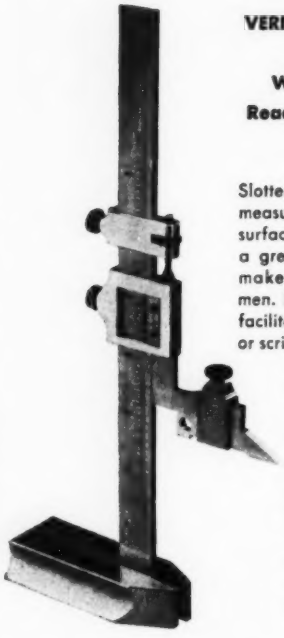

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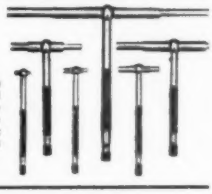
An improved telescoping gage with automatic, self-centering handle and twin contact plungers. Rounded contacts are hardened and ground; telescope under uniform spring tension; lock at any setting. Six sizes cover the range 5/16 to 6".



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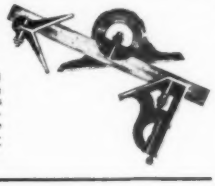

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American Machinist REFERENCE BOOK SHEET

Microstructures of Metals—IV

By Dr. MICHAEL FIELD
NORMAN ZLATIN
Dr. JOHN F. KAHLES
METCUT RESEARCH ASSOCIATES

WROUGHT-STEEL MICROSTRUCTURES

Steels can be divided into three major groups for the purpose of machinability consideration: (1) Low-carbon screw stock containing about 0.10% carbon, (2) Carburizing steels containing about 0.2% carbon, and (3) Medium-carbon alloy steels containing 0.35 to 0.5% carbon.

The microstructure of the low-carbon steels consists of about 85% free ferrite and 15% pearlite. The free-machining variety of these steels contains from 0.1 to 0.35% sulfur. There is little that can be done to improve the machining characteristics of this group of steels other than to add free-machining additives such as sulfur or lead.

Carburizing steels usually have a structure consisting of 70% ferrite and 30% pearlite. In such steels, the grain size may be large or small, and other variations may exist, depending on the heat treatment and cooling rate. For example, the distribution of ferrite and pearlite may be uniform or the ferrite and pearlite may assume a banded form. For good machinability, banding must be avoided and grain size should, in general, be large. Furnace annealing lacks the necessary refinement to maintain adequate control of microstructure. More recently, cycle annealing, especially salt-bath annealing which assures a uniform rate of cooling, has been found to offer a suitable procedure for obtaining uniform distribution of pearlite and ferrite, as well as definite grain size.

The carburizing steels likewise may contain free-machining additives to improve machinability.

Medium-carbon alloy steels, because of their higher carbon content, are capable of assuming a wide variety of structures, depending on the rate at which they are cooled. Thus, in annealed steels containing 0.4 to 0.5% carbon, the following structures are possible: (a) 90% pearlite with 10% free ferrite on grain boundaries; (b) 50% pearlite; 50% blocky, free ferrite; (c) widmanstatten; (d) spheroidized structure.

In addition, it is possible to have various combinations of the above structures. For example, a steel bar may have a structure consisting of coarse pearlite together with spheroidized carbides. In a thick bar it is possible to have the first structure on the outside where cooling was rapid, and a second structure on the inside where the cooling rate was slow. Such steels are also subject to variation in grain size and to banding.

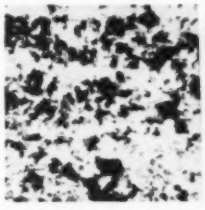
With uncontrolled cooling such as that obtained in cooling from rolling or forging, not only are variations in structure and grain size possible within one bar, but also large variations are possible from bar to bar. In a group of 36 bars purchased from the same heat in the as-rolled condition, practically every structure and combination listed above was observed. Furthermore, the hardness variation in this group of bars was between 180 and 310 Brinell.

These medium-carbon alloy steels can also be quenched and tempered to hardnesses from 200 up to 400 Brinell. In the manufacture of guns, a 220 Brinell quenched and tempered structure is specified, because steel in such a structure has higher impact strength than an annealed steel of the same hardness.

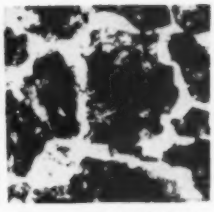
CAST IRON

Common gray cast irons have a structure consisting of pearlite and flaky graphite. The pearlite and graphite may be coarse or fine. Usually coarse pearlite is associated with

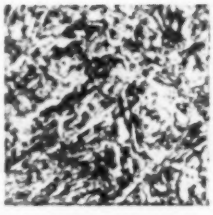
Structures Obtained With Same Steel by Heat Treatments



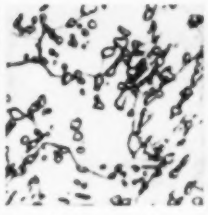
SAE 8640. Furnace annealed. 50% blocky ferrite, 50% fine pearlite. 205 Bhn. 100 X



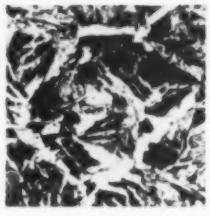
Furnace annealed. 30% network ferrite, 70% fine pearlite. 200 Bhn. 100 X



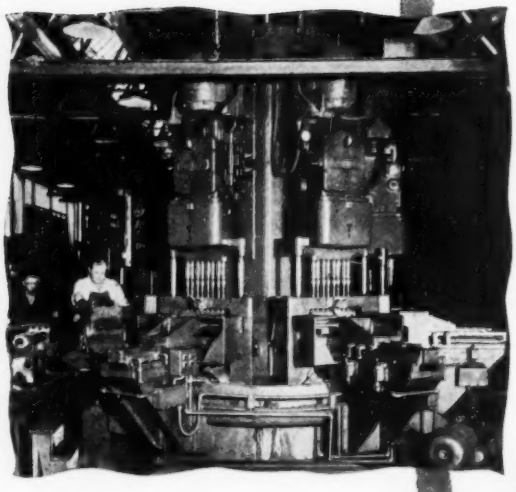
Air cooled from 2200 F. Widmanstatten structure. 250 Bhn. 200 X

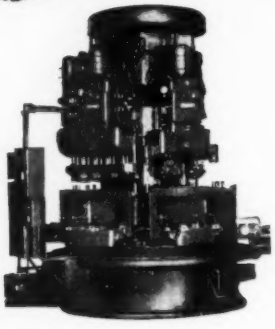


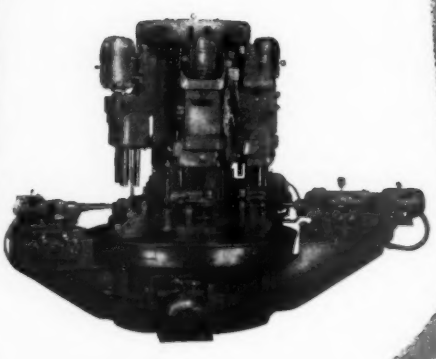
Spheroidized structure. 160 Bhn. 2000 X



Quenched and tempered structure. 400 Bhn. 1000 X







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Microstructures of Metals—V

coarse graphite, and fine pearlite with fine graphite, because the factors which produce coarseness of pearlite also produce coarseness of graphite. Thus, fine pearlite or fine graphite is associated with rapid cooling rate, low carbon content, low silicon content, and the presence of alloying elements such as chromium, vanadium and molybdenum. (Coarse pearlite means large grains and wide spacing between the alternate layers of ferrite and iron carbide).

Gray cast irons may also contain free ferrite, steadite, free carbide, manganese sulphide and various inclusions.

Free ferrite can be present in small quantities, say up to 10%, in the as-cast condition. To obtain very large percentages of free ferrite—50% or more—it is necessary to anneal the cast iron at temperatures of 1400 to 1600 F for periods of 1 to 8 hr. The presence of free ferrite is extremely beneficial to tool life.

Steadite is commonly found in cast irons containing more than 0.10% phosphorous. For common cast irons, steadite is present in quantities less than 10% and its presence in such small amounts has little effect on tool life.

Free carbide occurs in irons that have been cooled very rapidly. The forming of free carbide is accelerated by such alloys as chromium and vanadium. Even small amounts of free carbides are extremely detrimental to tool life.

Acicular structures are formed in high-strength cast irons which have been purposely alloyed.

Under extremely rapid cooling conditions, such as occur in thin casting flashes, "white iron" may be formed. This structure consists of about 50% fine pearlite and 50% free carbide but no free graphite. This structure is very hard and virtually unmachinable.

Manganese sulfide occurs as a trace in cast irons. Its presence would be beneficial to machinability but the amount present is usually so small that it has no noticeable effect.

Inclusions such as sand and slag may also occur in cast iron due to poor foundry control. They are detrimental to machinability and corrective steps should be taken to eliminate them.

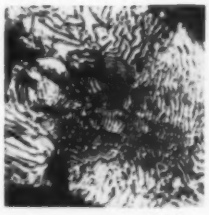
Malleable iron contains clusters or nodules of free graphite, instead of flake graphite. The matrix structure of malleable iron can be similar to that of cast iron; i.e., it may contain pearlite, free ferrite, manganese sulfide and steadite. The nodular graphite produces higher physical strength than the flake graphite.

Malleable iron is produced by heat treating previously cast white iron for from one to five days. It is more expensive than cast iron.

Recently, *ductile*, or spherical, or "nodular" graphite irons have been produced by direct casting by adding magnesium or cerium alloys to the ladle. Such irons contain spherical graphite and a matrix of pearlite or free ferrite. These as-cast ductile

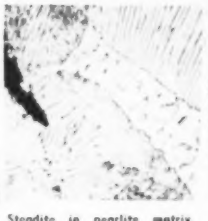
Structures That Occur in Gray Cast Iron

Flake graphite. Unetched. 100 X



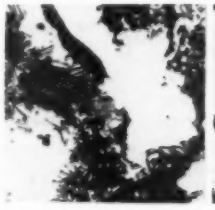
Coarse pearlite and flake graphite. 190 Bhn. 1000 X

Fine pearlite and flake graphite. 220 Bhn. 1000 X

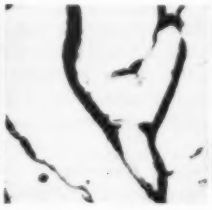


Steadite in pearlite matrix. 1000 X

Free carbide in pearlite matrix. Sharp grain boundaries. 1000 X



Free ferrite blends with pearlite. No definite boundary. 1000 X



Completely annealed ferrite and flake graphite. 120 Bhn. 1000 X

Partial anneal. Ferrite, pearlite and flake graphite. 145 Bhn. 1000 X

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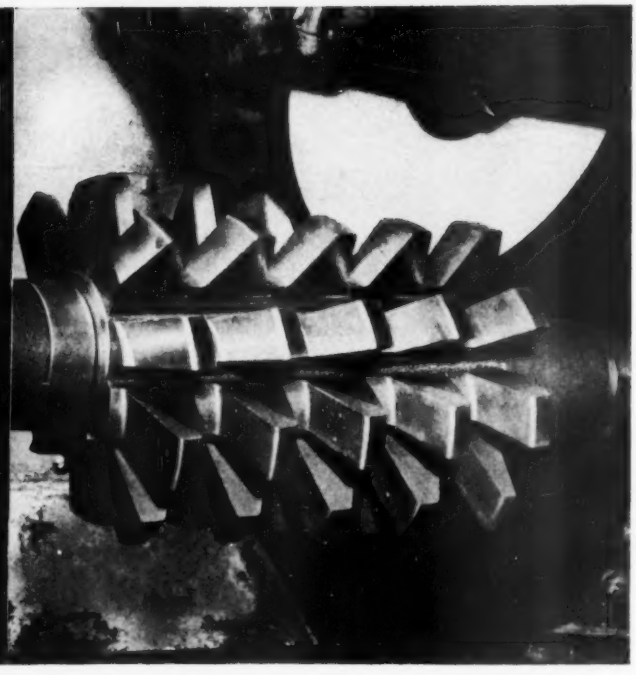

No grinding job is hopeless if you have a Robertson Cool-Cut Wheel on your machine. The performance of these revolutionary grinding wheels on jobs that "couldn't be done" has been amazing. Because of the unique open structure of the Cool-Cut Wheel, there is adequate space for chip clearance; the grains penetrate the metal and remove it cleanly. You'll find a Robertson performs better than a more close-grained conventional wheel; cuts faster; and, as hundreds of users have proved, has longer life.

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Large hobs with 1½" or greater pitch may be successfully ground with a 10" x 1" x 1" WA464-J2V Robertson Wheel. On smaller hobs, a Robertson 7" x 5/8" x 3/4" RA60-J2V will give highly satisfactory results. There will be no burning and very little heat generated. Experience has shown that you can expect a 50 percent or greater saving in grinding time when you use a Robertson Cool-Cut instead of a conventional wheel for hob grinding.

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Microstructures of Metals—VI

irons are not limited in size. Their physical properties are comparable to those of malleable iron and even the cast steels.

HARDNESS OF MICROCONSTITUENTS

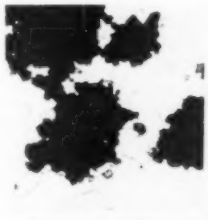
The hardnesses of microconstituents determine abrasiveness, and are the most significant factors affecting tool life. In general, the harder or more abrasive constituents produce shorter tool life for a given set of cutting conditions.

Table I gives the range of hardness of cast-iron microconstituents. (These values are at room temperature.) Free graphite is soft and amorphous and acts as a free machining agent in the iron. Free ferrite is the softest major constituent found in cast irons. Pearlite is about 50% harder than free ferrite and thus produces shorter tool life. Presence of steadite, which is very hard at room temperature, is not particularly detrimental to machinability when the content is less than 10%.

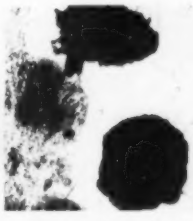
Free carbide is harder than tool steel and is almost as hard as sintered-carbide tool materials. Thus, even small amounts of free carbides, as little as 3 to 5%, reduce tool life drastically.

Table II gives the hardness of steel microconstituents. The Rockwell hardness values are likewise given for comparison. Wide range of hardness exhibited by most of the steel constituents is due to the range of chemical composition and heat treatments possible in commercial steels.

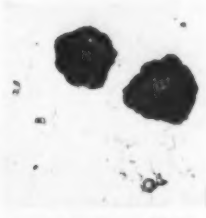
Heat Treatment Alters Properties of Irons



Malleable iron contains nodular graphite in ferritic matrix. 120 Bhn. 500 X



Ductile iron as cast. 215 Bhn. Spherical graphite in pearlite-ferrite matrix



Annealed ductile iron. 170 Bhn. Spherical graphite in free ferrite matrix

TABLE I .. **Hardness of Cast Iron Microconstituents**

MICROCONSTITUENT	Knoop Microhardness 100 gram load	
	Range of Values	Average
Free Graphite	15 - 40	20
Free Ferrite	215 - 270	240
Pearlite	300 - 390	350
Acicular	400 - 495	445
Steadite	600 - 1200	950
Free Carbide	1000 - 2300	1500
Hardened Tool Steel* $R_C = 60.5$	730 - 760	740
Sintered Carbide** Cutting Tool	1700 - 1940	1800

*From Thibault and Nyquist. Presented for comparison with cast-iron microconstituents.
**Hardness of a particular grade of carbide as determined by Thibault and Nyquist.

TABLE II .. **Hardness of Steel Microconstituents**

MICROCONSTITUENT	Rockwell	Knoop 500 gm
Ferrite—Unalloyed and Alloyed	70 - 85 R_B	150 - 240
Pearlite—Coarse to Fine	10 - 40 R_C	200 - 400
Spheroidite	72 R_B - 25 R_C	140 - 300
Widmanstatten	80 R_B - 27 R_C	170 - 300
Bainite	39 - 60 R_C	400 - 720
Martensite—Various Degrees of Tempering	20 - 67 R_C	260 - 900
Carbide		1000 - 2000*
Sulfide		180**

*25 gram load.
**25 gram load — from J. D. Armour, Union Drawn Steel Division.

ASK

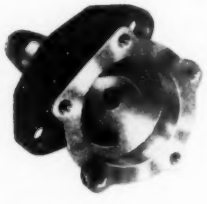
BAIRD

ABOUT IT!

HIGH PRODUCTION TOOLING

5 LONGITUDINAL, 5 CROSS SLIDES *with a* BAIRD *automatic* CHUCKER

MACHINING A CAST IRON OIL PUMP BODY



1ST OPERATION: Face flange, finish counterbore I D and depth, cut groove in flange, drill and tap 5 $^{7}/_{64}$" holes. Work held stationary for drilling and tapping . . . OTHERWISE WORK ROTATES. Production: 308 pieces per hour.

2ND OPERATION: Face and turn shank end, undercut spot drill and drill center hole thru to cored section, turn OD of shank, ream center hole, drill 2 $^{15}/_{32}$" holes. Production: 222 pieces per hour.

Completely Automatic Operations . . . Hands Free

THE OPERATOR of a Baird 7", 6 spindle horizontal chucking machine likes his job. The open construction gives him easy access to all tooling . . . fast set-up. The automatic mechanism that operates the chucks does away with chucking levers, valves and gages . . . leaves both hands free. Reliable mechanical and electrical safety devices protect him, his machine, and the work. He clearly sees the advantages of independently operated tool slides, many combinations of spindle speeds and the means to mill and cross mill. He's proud of his accomplishments for every shift.

THE PRODUCTION MANAGER likes the way the time sheets read (note this typical job). You can't go far wrong with such production.

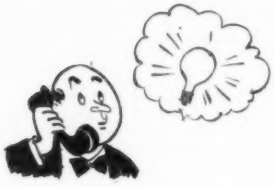
MANAGEMENT, that makes the investment in Baird high production machinery, sees the favorable financial returns . . . the many profitable operating years of the Baird 7.6H Chucker . . . the machine that keeps young in performance, even when it becomes old in years.

FULL DETAILS AND BULLETIN ON REQUEST

the **BAIRD MACHINE COMPANY**
STRATFORD • CONNECTICUT

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

TALKING SHOP



Night Rust

HIGHLY FINISHED parts of steel rusted every night in one war plant. The emergency solution was to cover with oil every night and clean every morning. Then the manager phoned a smart old Swede at his former plant for advice. Said the Swede: "What makes it rust?" Said the manager, "Condensation from the atmosphere." Said the Swede, "Why?" Said the manager, "Because moisture condenses on the coolest thing around." Said the Swede, "Well?" Said the manager, "Look, I can't put those parts in an oven every night, and I couldn't get infrared bulbs in time. I got troubles now!" Said the Swede, "Dummer! Why not light bulbs?"

So a few shaded lamps, over the trays of parts, ended a crippling corrosion problem.

All on One Floor

FLOORS in the new plant of Saco Products Div., Saco-Lowell Shops, Saco, Me., are insulated slab, placed flat on the ground. This permits an "unlimited" loading (actually over 1000 lb per sq ft). To provide such bearing strengths over basement areas—such as those for lockers, washrooms, etc.—was found more costly than to make the building larger and place these facilities on the working floor. By the same token, elevated wash and toilet facilities were also more costly—and less convenient—than the comparable "all-in-one-floor" layout.

Ear Mill

A GEAR-EQUIPMENT manufacturer recently ordered a 12-tooth carbide-tipped face mill with 15° axial clearance (top rake) and −5° radial clearance for a 6-in. cut ¼ in. deep on weldments. Lovejoy supplied a Type S, one of those cutters with carbide preforms wedged into a slot. "Like trying to mill with an ear of corn," commented the master mechanic. But he was surprised to find he could use the maximum feed of the planer-type miller, 64 ipm, and a speed of 285 rpm, and had no chatter. Work and cutter stayed cool, and he got a first-class finish at well under previous horsepower requirements. When the cutter dulled, he reground it—and has since been unable to get over 14-ipm feed without chatter and poor finish.

Sounds like another case of "approximate" angles on cutters, when the regrinder in the tool crib decides he can tip the cutter a little and save grinding, because "a degree or two doesn't make any difference."

Apparently it does.

One-Cut Finishing

SACO-LOWELL, Biddeford, Me., has been machining cast-iron head frames for textile machinery in one cut, even though they are only 1 in. thick and about 36 x 48 in. Rigidity in fixture and machine is the answer. With care in setup and a tight machine, warpage can be held to less than 0.0015 in.—and no aging or turning over involved.

Daffynitions

INFLUENCE: what an old man tries to retain and a young man to attain . . . INFLATION: prosperity on the cuff . . . WIFE: gal who will do battle at the drop of a dish . . . MODERN MATRIMONY: short-term bond . . . FANATIC: man who won't change his mind and can't change the subject . . . NET PROFIT: fish . . . LANDLORD: fellow who looks for the handwriting on the wall . . . POLITICIAN: man with straddlesores . . . TEACHER: gal who makes the little things count . . . FEMININE TOUCH: what gets into your pay envelope . . . LADY WRESTLER: Glamazon . . . HARP: nude piano . . . COURTSHIP: interlude between lipstick and mopstick . . . DRESSED BEEF: formal complaint . . . GOOD OLD DAYS: when you couldn't see through the politicians or the candy bars . . . FLOOD: river too big for its bridges . . . ATOM BOMB: destruction, economy size . . . SIX FEET: height of a girl's ambition . . . CRACK OF DAWN: "good morning" . . . WIDE OPEN SPACES: red area, surrounded by teeth.

Speed in 1944

GERMANS had a high-speed lathe for making high-tensile aircraft bolts. It ran at 1500 to 5000 rpm, depending on work diameter. With a carbide tool, ⅝-in. dia stock was cut at 2400 rpm (about 390 sfpm—about twice normal speed) with 0.01-cm feed per rev and cut 0.2 mm (0.0078 in.) deep. A 12-in. bolt was thus roughcut in 68 sec, finished in 35 sec at 4750 rpm. The dead center was ball-bearing mounted, and a cam-controlled steadyrest worked opposite the tool.

For Ideas

GENERAL MOTORS has just increased its maximum award for an accepted suggestion from a $1000 Defense Bond to $2500 in such bonds, and the minimum award from $7.50 to $10. Eligibility has been broadened also. In the nine years of the corporation-wide plan, awards totaling $5,740,000 have been paid for about 145,000 accepted suggestions, thus the average is about $40. Some 728 maximum awards have been paid.

For Want of a Nail

REMEMBER that old jingle about the horseshoe nail when Richard III lost the throne of England as a result? Hitler failed to study history carefully for in World War II, the "High Command" failed to appreciate the necessity for fasteners. Skilled labor, technicians, and engineering talent were drafted freely, either for the armed services or for other manufacturing plants. The scarcity of bolts and nuts became so serious by 1944 that the mistake was clearly recognized—but too late to rectify the error. This loss of technical skill absolutely stopped all progress in the fastener industry. Fighter planes, urgently needed for the 1944 invasion defense and the later drive into Belgium, could not be assembled.

The part that seems most simple and abundant may easily become the "weakest link."

News of Metalworking

NPA up to date ...

(A summary of NPA orders announced since AMERICAN MACHINIST issue of Jan. 22 in which all NPA regulations were summarized in the Special Report, "Metalworking Guide to Defense Business." Copies of this report may be obtained by writing to *AM.'s* Readers' Service Dept.)

NOTICE 1 (as amended) — **Designation of scarce materials.** Adds the following items to the anti-hoarding list of NPA Reg. 1: Industrial ethyl alcohol, chlorine, zinc dist and oxides, natural and synthetic rubber, and five textile items.

M-1 (as amended) — **Iron and steel.** Increases 2% to 15% most percentage ceilings for acceptance of rated orders. Establishes 45-day maximum inventory for steel products and gray and malleable iron castings, and 30-day maximum inventory for pig iron. Products other than "steel mill products" added to original list are: steel castings and forgings, wire rope and strand, welded wire fabrics, wire netting, pig iron, and malleable and gray iron castings (except cast iron soil and pressure pipe). Establishes minimum quantities below which producers are not required to accept rated orders.

M-4 (as amended) — **Construction.** Commercial construction generally will be authorized when it (1) Furthers the defense effort; (2) Is essential to public health, welfare or safety; (3) Will alleviate or prevent a hardship to a particular community. Makes more materials available for the industrial plant expansion program. Order places no restrictions on storage or warehouse buildings used by manufacturers or processors.

M-8 (as amended) — **Use of zinc.** Adds some definitions, without altering coverage or purpose of original order. Defines "manufacture" as to "put into process, machine, incorporate into products, assemble, fabricate or otherwise alter the forms and products of zinc by physical or chemical means. "Zinc" means "slab zinc which has been produced by electrolytic, electrothermic, or fire refining process, including zinc produced from scrap, dross, other secondary material, and any alloy in which the percentage of zinc by weight is more than 50%."

M-20 — **Iron and steel scrap.** Applies to scrap dealers, brokers, auto wreckers, or scrap producers. They may not receive scrap if it increases inventory beyond minimum practicable working level or average of inventory during last 60 days.

M-22 — **Distribution of aluminum scrap.** Prevents undue accumulation of aluminum scrap. Provides that only approved smelters or fabricators may melt, smelt or otherwise use aluminum scrap. Foundries are, under certain conditions permitted to remelt the gates, sprues, risers and defective castings resulting from their own operations. Thirty-two approved aluminum smelters and four approved aluminum fabricators are listed.

M-30 — **Tungsten.** Provides for allocation of all forms of tungsten (except tungsten ores and concentrates and tungsten scrap) based on end-use essentiality beginning March 1. Requires use of substitutes wherever possible; limits use of tungsten in all types of pigments and inks, in grinding wheels, and restricts use in high-speed steels. Firms that use not more than 500 lb of high speed steel during any quarter are exempt from the order.

Controlled Materials Plan Due July 1 Will Regulate Industry Operations

WASHINGTON—Most of industry will be operating largely under orders from Washington after July 1. That's the date set by the Defense Production Administration for the start of a new Controlled Materials Plan.

Initial orders, reporting forms for industry and informational material now are being prepared. Business probably will get formal notice of the part it is expected to play under CMP within the next month.

The new program will bear considerable resemblance to the World War II CMP. It will be based on complete government regulation of the use of steel, copper and aluminum.

But, for a while, at least, considerably less than 100% of the economy will be directly controlled by CMP. The controlled production—that which supplies military and essential civilian requirements—will be taking much less out of the economy than the original CMP at its height in 1945.

One measure of the difference is the demand for metals for military requirements alone. These demands will take less than half the available supply of aluminum and copper and less than a quarter of the carbon steel this year.

• **Allocations** for other esential uses will take more metal, but, theoretically, CMP won't touch the unallocated portions. But the fact is DPA has no intention of permitting a wild scramble for production not used for essential programs. The mobilizers already have taken steps.

Bans on construction, like last week's freeze on commercial building, saved critical materials across the board.

There'll be more such curtailments, before and during CMP, to trim nonessential demands to the shrinking pattern of unregulated production. In effect, this really is government control of all production, since DPA will either ban outright, or shut off materials for, output it wants to discourage.

Obviously the mobilizers want to keep up some production of automobiles and appliances. There will be cutbacks of 10% to 30% in each industry this year, because of materials shortages even if Washington doesn't order a flat reduction. But mobilization planners want to keep these production lines going until they can be converted, line by line, to defense work.

But by the end of 1951 DPA will be allocating materials for virtually every industry. Deliveries of military equipment will be rolling. All the really essential civilian requirements will be so rated and made part and parcel of CMP. And government-encouraged expansion of plant, especially steel and aluminum, will be taking another big bite of materials.

Right from the start CMP will bring scheduling of all defense and other essential production. Makers of such materials and equipment will tell the government how much copper, steel and aluminum they need and when they'll need it. This list will be screened by DPA, which will match them against the available supplies of the three metals. It will grant allocations, not to manufacturers themselves, but government claimant agencies.

The claimant agency—like the Navy for torpedo production—will split metals allocations among its prime contractors. The prime contractors, in turn, will parcel out suballocations to subcontractors.

• **All rated orders** will be scheduled as to the amounts of materials used and when they are needed, from the initial fabricating stages upward. Thus DPA and the materials suppliers will know in advance the exact requirements under each allocation. This obviates the need for a gigantic police force for CMP—everyone knows just where he stands and there's little or no room for chiselers.

DPA will use the same controls—scheduling and allocation — to straighten out snarls in the supply lines of other materials.

There still will be priorities, the present "DO" ratings or, perhaps, multiple-band ratings. These will simply be for the guidance of a manufacturer who gets more than one contract with the same or approximate delivery dates.

SHORT BAR LENGTHS get zinc phosphate coating (left) to serve as a lubricant, are then extruded from the middle toward both ends to form transmission shafts as . . .

Cold Extrusion Goes Commercial

DETROIT—Transmission shafts are being turned out at a rate of 1600 per day on a handful of machines at Molloy Mfg. Co. here. One of the first commercial applications of cold extrusion of steel (*AM*—Apr. 3, '50, p174), the method has cut material requirements by one third.

In addition, a lower grade of steel can be used with no sacrifice in quality because of the superior properties produced by cold extrusion. Material savings also represent machining savings because shafts are held in extrusion to 0.001 to 0.002 in. and require only finish machining.

• **Development work** began during the war. The 25-man shop organized by Brian Molloy in 1940 was engaged in bolt and stud production for the Air Force. Odd-sized bolts could not be made on cold headers, had to be turned out from bar stock.

A lot of hard-to-get steel had to be turned away. Molloy started experimenting with drawing out bar stock to the final shapes of bolts (which were of various diameters through their length). Molloy is still using extrusion in making bolts and studs.

Tail nozzles for rocket motors were the next project, and the extrusion process was close to production when the war ended. With this experience they were ready to tackle civilian production. Molloy sold two auto companies on the merits of his process for transmission shafts.

• **Main problem** was to determine just how much reduction to allow in each extrusion operation, but a lot of development work also went into getting the proper dies and surface lubricant.

Medium-carbon, 1½-in. bar stock, heat treated to a tensile strength of 100,000 psi, is cut to 14-in. lengths. These slugs are given a special chemical surface treatment in a heated bath which produces a strong crystalline deposit of zinc phosphate on a soap base. This lubricant must be dry before the slug is put in the dies.

THREE STEPS are required in cold extrusion from 14-in. bar at left to 22-in. transmission shaft. Machined shaft is shown at extreme right

Actual extrusion is done from the middle toward both ends in three-station cemented carbide dies, preferably in horizontal hydraulic presses. Dies must be held to close tolerances to insure proper filling of diameter steps at each stage.

The zinc phosphate coating is strong enough that a film remains on the part after the third extrusion stage. All circular forms, such as tapers, fillets, and cylindrical steps are produced to specified limits on all parts. Molloy has cold extruded all sorts of shafts and spindles, including one with on offset pin on one end.

Molloy's presses are war-asset purchases, rebuilt and specially fitted for the cold extrusion job. They have capacities of 200 to 250 tons. Heavier presses are being built to handle larger parts.

• **Success** with transmission shafts leads Molloy to believe that cold extrusion of steel "is not in the experimental stage—as far as Molloy is concerned—it's in the application stage."

Molloy thinks he could extrude rocket and projectile shells with his process—but that the job would have to be analyzed and fitted with machinery that suits it alone. This is an aim of present Ordnance work.

Defense Plant Expansion

STEEL MAKING—Bethlehem Steel has announced a $300 million program for expanding its steel-making facilities by 2.6 million ingot tons. This figure includes 1 million tons which came into being during 1950. Tonnage distribution: 1,080,000 at Lackawanna, N.Y.; 740,000 at Sparrows Point, Md.; 352,000 at Steelton, Pa.; 188,000 at Bethlehem, Pa.; 180,000 at Johnstown, Pa., and 60,000 tons at Los Angeles.

STRIP, BAR, ROD PLANT—Carpenter Steel Co., Reading, Pa., will build a combination strip, bar and rod plant to meet needs for production of tool, stainless and alloy steels. Mill will provide material for company's cold-rolling and cold-drawing departments, as well as items for direct sale as hot-rolled items.

ALUMINA—Aluminum Ore Co., East St. Louis, Ill., an Alcoa subsidiary, will construct a new alumina plant at Bauxite, Ark., which will employ 1000 men.

STRATOJET BOMBERS—Douglas Aircraft Corp. will build Boeing B-47 Stratojet bombers at its wartime Tulsa, Okla., plant, to be reopened immediately. The plant is currently in use as a Corps of Engineers storage depot. Production of the bomber will augment output of Boeing's present B-47 plant at Wichita, Kans.

AIRCRAFT PUMPS—Ford Motor Co. will start construction soon at its Automatic Transmission Div. plant in Cincinnati of an extension for manufacture of aircraft engine lubrication pumps for Pratt & Whitney B-36 bomber engines. The extension will double present plant floor space.

JET ENGINE CENTER—General Electric Co. will more than triple the space it now occupies at Lockland, Ohio, with a multimillion dollar expansion. Facilities will be established for manufacture of jet engine components, and present jet engine assembly operations at Lockland will be increased. The Aircraft Gas Turbine Divisions' executive, engineering and commercial staffs will move to Lockland from Lynn. Manufacture, assembly, and test of turbojets and turbosuperchargers will continue at Lynn and Everett, Mass.

Defense Contracts Pour From

WASHINGTON—Defense contracts for military goods are pouring out to industry at a quickened pace. During calendar 1951 the Pentagon hopes to put out $40 billion worth of business for weapons, clothing and food. The Defense Department's procurement program for the year-and-a-half ahead will supply the weapons and equipment for the mobilization goal of 3,472,000 troops under arms.

Today's $3-billion a month rate of letting contracts, double the rate of last August, will move upward steadily, to $3.4 billion a month in February, around $3.6 billion in June, almost $4 billion a month in January 1952, and more than $4.5 billion by the end of 1952.

• **The procurement schedule:** By March 1, all major items of procurement under the $87-billion program will be scheduled. Target dates will be known. Scheduling will be complete on 50% of the dollar value of the entire program by February 15.

From July 1 to Dec. 31, the Defense Dept. had obligated slightly over $12 billion for manufactured goods, at an average rate of $2 billion per month. During this period, over 500,000 contracts were let.

Two biggest items of obligation during this period were aircraft and tanks. Production from these contracts can be expected to start rolling in this year. According to present plans, contract letting for aircraft and tanks will be shaded during the remaining months of fiscal '51 by obligational authority for spare parts such as crank shafts, propellers, turbines, bearings, rather than original equipment.

The Pentagon is making more and more use of letters of intent to get manufacturers started on the job even while contractual talks are still going on. Some manufacturers, particularly tank makers, will be advanced defense funds to tool up for tank construction until actual contracts are let.

• **Army plans:** Needs no new heavy guns, rifles, or machine guns. The 3.5-in. bazookas and shaped charges are prime necessities at present. Tank procurement for next two years will be about 20,000 medium tanks per year. Ammunition will run tanks a close second in procurement. Stockpiling of ammunition will be heavy. Schedules for immersion proof trucks and jeeps have already been established.

• **The Navy:** Some conversion of Essex class carriers is going on at Navy yards. Private yards will probably get some business. Submarine and destroyer modifications are already scheduled.

• **Air Force:** Air Force procurement calls for building productive capacity for 50,000 planes a year—ten times this year's expected output. However, plane estimates may be revised downward somewhat due to ability of jets to withstand considerably more punishment than the propeller-driven craft.

• **Research:** Since the end of the war, research has been carried on at a rate of $500-$600 million per year. This year it will be about $1.2 billion. About 90% of this year's funds will go into the procurement of items to be tested by the services—such as new bazookas, tanks and aircraft.

The stepped up pace of defense orders is indicated in such recent Army tank contracts awarded to Cadillac, Ford and Buick. Cadillac's tank contract is for $300 million instead of $110 million originally dis-

Wright Wants Subcontractors

NEW YORK—Wright Aeronautical Corp., Wood-Ridge, N. J., still is looking for subcontractors despite a flood of responses to recent calls sent out by Wright and by the New York Air Force Procurement office recently.

Manufacturers qualified to make the following parts should contact C. C. Shellberg, purchasing manager, Wright Aeronautical Corp., Main & Passaic Streets, Wood-Ridge, N. J.:

(1) Hardened and ground parts. Sources with carburizing and nitriding facilities preferred; (2) Fabricated sheet metal—stainless steel. Press and certified welding equipment required; (3) Gears; (4) Screw machine products; (5) Aluminum castings, raw and finished; (6) Magnesium castings, raw and finished; (7) Steel castings, raw and finished; (8) Aluminum forgings, raw and finished; (9) Controls and accessories; (10) Engine sub-assemblies.

Military Procurement Offices at Faster Pace

closed. On top of that, Cadillac has a $106-million contract for an undisclosed type of combat vehicle to be assembled at the Cleveland Tank Plant. Ford will build tank engines and spare parts at River Rouge under a $40-million award. Previously Ford got a $31-million order for Army trucks and buses. Buick's $65-million contract is to build 3000-lb tank transmissions at Flint.

Bowen & McLaughlin Co., York, Pa., is working on a $25 million order to repair medium tanks for the Army. "Several thousand" half-tracks and high-speed tanks will be remanufactured at a new plant at Hitchcock, Tex., where 1000 will be employed. Engines will be rebuilt at a factory at Phoenix, Ariz.

Recent Air Force contracts include Hudson Motor Car's contract to build Wright R3350 reciprocating engines for Navy Aircraft, Packard's contract to build GE J-47 jet engines, and Kaiser-Frazer's subcontracting of components for the Lockheed P2V Neptune Navy anti-submarine patrol bomber at Oakland, Calif. Air Force has also announced allocation of $24,700,000 for reconditioning and retooling of two plants—$14,700,000 to Ford to develop facilities for production of Pratt-Whitney Wasp major engines at Chicago, and $10 million to Kaiser-Frazer to prepare the Willow Run plant in Detroit for production of the Fairchild C-119 Packet cargo plane.

Other large defense contracts, announced in January, follow:

ARMY

Campbell Chain Co., York, Pa., tire chains, $600,178.

Bendix-Westinghouse Automotive Airbrake Co., Elyria, Ohio, air compressors, assembly, $104,340.

Alexander-Tagg Industries, Hatboro, Pa., mufflers, $102,600.

Electric Auto Lite Co., Toledo, armatures, frame.

General Motors Corp., Detroit, switch, spring, etc., $141,237.

GMC Truck & Coach Div., Pontiac, Mich., collar, seal, $130,761; covers, $211,527; drums, $150,516; yoke, rod, $25,420; bands, bolts, levers, etc., $80,875; fenders, panels, pans & boards, $44,373; support, fork shifter lock, $97,159.

United Motors Service Div., General Motors Corp., Detroit, thermostats, $47,086; boots, covers, screws, $119,468.

AC Spark Plug Div., General Motors Corp., Flint, Mich., shaft, tach., $35,550.

Delco Products Div., General Motors Corp., Dayton, Ohio, shock absorbers, suspension, $104,200.

New Departure Div., General Motors Corp., Bristol, Conn., bearings, $470,362.

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind., degasser, eng., carb., $424,001; piston kits, $181,044.

Kenworth Motor Truck Corp., Seattle, shaft, $120,442; extension, seal oil filter oil flange, etc., $123,304.

The Anderson Co., Gary, Ind., kits, $249,553.

Stover Lock Nut & Machinery Co., Easton, Pa., nuts, $133,650.

Watson Automobile Equipment Co., Washington, D. C., ambulances, $1,853,115.

Federal Motor Truck Co., Detroit, axles, gears, $693,154; cases, $204,000.

General Electric Co., Detroit, lamps, $592,667.

Trico Products Corp., Buffalo, windshield wiper motors, $102,800; arms, $402,601.

White Motor Co., Cleveland, engines, with accessory, assemblies, $368,634; lid, real locker assembly, $134,834.

Diamond T Motor Car Co., Chicago, valves, relay, $179,400; crankshaft, $200,820; starters, $209,312.

Ward LaFrance Truck Corp., Elmira, N. Y., cabs, $117,805; axle differential, etc., $206,149; retainer and axles, $203,762.

Gabriel Co., Cleveland, absorbers, $206,832.

Chrysler Corp., Detroit, gears, $145,681.

United States Electric Tool Co., Cincinnati, valves, $101,822.

George K. Garrett Co., Philadelphia, misc. washers, $197,195.

Clayton Mfg. Co., Rosemead, Calif., cleaners, $251,208.

Oakland Truck Sales, Inc., River Rouge, Mich., shafts, $120,925.

Holland Hitch Co., Holland, Mich., pintles, $119,796.

Universal Products Co., Dearborn, Mich., yokes, shafts, $194,220.

Triplex Corp. of America, Pueblo, Colo., pistons, $506,663.

Spicer Mfg. Div., Dana Corp., Toledo, shaft, joint, yoke, $134,475.

Willys-Overland Motors, Toledo, bolts, shaft, etc., $84,210; bell crank, gear, $189,054.

Allis-Chalmers Mfg. Co., Milwaukee, sleeve, shaft, $131,548; cam, gasket, filler, etc., $1,378,191; washers, wheel track, $722,760; drums, boots, rings, gages, etc., $308,989; cables, pipe, adapter, etc., $809,311.

Bearings Co. of America, Lancaster, Pa., bearings, $118,389.

Electric Storage Battery Co., Detroit, batteries, $233,315.

Russell, Birdsall & Ward, Port Chester, N. Y., nuts, $27,157; screws, $62,654.

Press Rite Metal Products, Hazel Park, Mich., windshield frames, $144,800.

Gear Grinding Machinery Co., Detroit, misc. shafts, $463,894.

Thiry Machine Co., Detroit, rods and housing, $160,150.

Jefferson Chev. Co., Detroit, cylinders, $283,500.

Wagner Electric Corp., St. Louis, cylinders, $217,950.

New Process Gear Corp., Syracuse, N. Y., bushings, lever, shaft, snap rings, etc., $455,638.

Liggett Spring & Axle Co., Monongahela, Pa., springs, front, assembly, $131,400.

Budd Co., Detroit, hubs, covers and drums, $531,060.

Track Equipment Co., Inc., Buffalo, N. Y., arm, track, $600,968.

Perfex Corp., Milwaukee, misc. radiator parts, $1,042,705.

Chefford Master Mfg. Co., Fairfield, Ill., modify 4.2-in. M3 HE shells, $479,228.

Rodom Distributors, Inc., New York, modify 4.2-in. M3 HE shells, $332,972.

Wolverine Tube Div., Calumet & Hecla Consolidated Copper Co., Detroit, Rotating bands for shells, HE 90mm, $591,245.

Automatic Machine Products Co., Attleboro, Mass., primers, percussion, $499,010.

Colt's Mfg. Co., Hartford, Conn., gun parts, $317,730.

Mid-West Forge Co., Cleveland, barrel blanks, $109,428.

F. J. Kirk Molding Co., Inc., Clinton, Mass., cap, magazine, $99,295.

Haynes Stellite Div., Union Carbide & Carbon Corp., Kokomo, Ind., investment castings, $279,770.

Ex-Cell-O Corp., Detroit, spring, washer, $105,750.

Mount Vernon Metals, Inc., Grand Rapids, Mich., ammunition boxes, $393,980.

Lloyd & Arms, Inc., Philadelphia, automatic lathes, $175,923.

Wallingford Steel Co., Wallingford, Conn., steel and cartridge clips, $140,045.

Bethlehem Steel Co., Bethlehem, Pa., tube forgings, jacket forgings, $500,000.

Midvale Co., Nicetown, Pa., tube forgings, jacket forgings, $500,000.

Hughes Tool Co., Houston, Texas, reactivate and rehabilitate government-owned gun-tube casting and/or forging plant known as Dickson Gun Plant, Houston, $2,500,000; production and delivery of government tube castings and/or forgings for 90mm gun, $1,000,000.

National Forge & Ordnance Co., Irvine, Pa., forgings, alloy steel; tubes for 75mm gun, $290,000.

General Dry Batteries, Inc., Lakewood, Ohio, batteries, $288,240.

Burgess Battery Co., Freeport, Ill., batteries, $144,895.

P. R. Mallory & Co., Inc., North Tarrytown, N. Y., batteries, $454,219.

Bowers Battery & Spark Plug Co., Reading, Pa., batteries, $182,616.

Parkchester Machine Corp., New York, flash ranging sets, maintenance parts, $188,623.

Johnson Service Co., Milwaukee, radiosonde, $3,041,250.

Federal Telephone & Radio Corp., Clifton, N. J., components of radio items, $11,484,239.

Lewyt Corp., Brooklyn, N. Y., radio sets, $1,732,291.

Sylvania Electric Products Co., New York, electron tubes, $221,700.

ARF Products, Inc., River Forest, Ill., radio sets, $2,276,090.

William Brand & Co., Inc., Willimantic, Conn., wire, $1,360,876.

Union Carbide & Carbon Corp., New York, batteries.

U.S. Rubber Co., New York, cable assembly, $3,241,649.

Duke Mfg. Co., Linden, N. J., headsets, microphone assembly, $638,580.

J. H. Halen Corp., Cleveland, truck V-17, $952,060.

Bay Engine & Parts Co., San Francisco, spare parts, $106,599.

Alemite Sales Co., Inc., Chicago, spare parts, $199,498.

Linde Air Products Div., Union Carbide & Carbon Corp., New York, cylinders, $143,512.

Rea Magnet Wire Co., Ft. Wayne, Ind., wire, magnet, $144,382.

Wire Rope Co. of America, St. Joseph, Mo.

John A. Roebling's Sons, Chicago, wire rope, $131,000.

R. G. LeTourneau, Inc., Peoria, Ill., wire rope, $166,925.

Consolidated Photo Engravers & Lithographers Equipment Co., Chicago, cameras, $202,965.

Reider Bros., Chicago, tool chests, $398,522.

Athey Products Corp., Chicago, winch, dirt, $116,010.

Independent Pneumatic Tool Co., Aurora, Ill., drills, $160,115.

Chicago Pneumatic Tool Co., Chicago, drills, $214,652.

Pioneer Engineering Works, Minneapolis, power units, $174,900.

Converto Mfg. Co., Camo idge City, Ind., spare parts, $130,157.

NAVY

Teletype Corp., Chicago, teletypewriter equipment, $250,000.

Hoffman Radio Corp., Los Angeles, Calif., radio sets, $600,000.

Cleveland Diesel Engine Div., General Motors Corp., vapor compressors, $700,000.

Air Associates, Inc., Teterboro, N. J., radio receiver sets, $405,600.

Vulcan Iron Works, Denver, Colo., minesweeping winches, $100,000.

Gould-National Batteries, Inc., Depew, N. Y., submarine storage batteries, elements, $800,000.

Fidelity Electric Co., Inc., Lancaster, Pa., motor generators, $574,285.

I-T-E Circuit Breaker Co., Philadelphia, switchgear; generators, $164,867.

Kruz & Root Co., Inc., Appleton, Wis., motor generators, $118,536.

Glenn L. Martin Co., Baltimore, kits of parts for incorporating a hydraulic spring assist in aircraft, $176,256.

Edwin L. Wiegand Co., Pittsburgh, Pa., gun heater systems, $900,000.

Detroit Diesel Engine Div., General Motors Corp., generator sets, $200,000.

Blackmer Pump Co., Grand Rapids, Mich., pumps, $647,634.

Stered Mfg. Co., Newark, N. J., cabinets, stowage, aluminum, $755,656.

Packard Motor Car Co., Detroit, 6-cylinder, 300hp propulsion diesel engines, $3,500,000.

Oerlikon Machine Tool Works, Buehrle & Co., Zurich, Switzerland, Oerlikon 20mm 5TG guns, mounts, spare parts and ammunition, $146,470.

(Continued on next page.)

Defense Contracts

. . . continued

Ingersoll-Rand Co., Philadelphia, portable air compressors, $187,695.

Dayton Aircraft Products Co., Dayton, Ohio, bomb racks for aviation armament, $413,760.

Signode Steel Strapping Co., Chicago, flat steel strapping, $143,769.

Allegheny Steel Band Co., Pittsburgh, flat steel strapping, nailless, $324,880.

Reynolds Metals Co., Louisville, Ky., aluminum alloy, clad, heat treated sheet, $153,472.

Central Bank of Oakland, Calif., Pratt & Whitney engines, $398,250.

Construction Sales Corp., Albany, N. Y., weight, ballast, iron, $360,000.

Aero Supply Mfg. Co., Corry, Pa., valve selector for use on aircraft, $158,024.

Northeastern Engineering, Inc., Manchester, N. H., radiosonde, transmitters, $297,837.

National Electric Products Corp., Pittsburgh, Pa., cable, radio, for shipboard use, $408,171.

Dravo Corp., Philadelphia, various repair parts for turbines and marine pumps, $873,560.

Cleaver-Brooks Co., Milwaukee, distillation unit packaging, etc., $333,589.

Purolator Products, Inc., Rahway, N. J., fuel oil filter assemblies, $1,603,801.

Sikorsky Aircraft Div., United Aircraft Corp., Bridgeport, Conn., helicopters, $3,137,-684.

Glenn L. Martin Co., Baltimore, aircraft deck turrets, $4,914,000.

Kearney & Trecker Corp., Milwaukee, universal milling machines, $109,678.

Air Force

Lockheed Aircraft Service, Inc., Burbank, Calif., reconditioning of aircraft, $3,060,000.

Pacific Automotive Corp., Burbank, Calif., reconditioning of aircraft, $3,060,000.

Beech Aircraft Corp., Wichita, Kan., fire bombs, $4,760,000.

Wilcox Electric Co., Inc., Kansas City, Mo., receiver-transmitters, $621,741.

Douglas Aircraft Co., Inc., Santa Monica, Calif., airplanes, $3,840,000.

Bendix Radio Div., Bendix Aviation Corp., Baltimore, receiver transmitters, $1,559,237.

Minneapolis-Honeywell Regulator Co., Minneapolis, automatic pilot components, $2,000,-000.

Philco Corp., Philadelphia, microwave systems, $1,500,000.

Gilfillan Brothers, Inc., Los Angeles, Calif., components of radar sets, $394,985.

Link Aviation, Inc., Binghamton, N. Y., trainers, atimulators, $2,000,000.

Sperry Gyroscope Co., Great Neck, L. I., N. Y., flight computer systems, $6,105,000.

Jack & Heintz Precision Industries, Inc., Cleveland, starters and adapters, $132,701; generators, $1,163,808; starters, $947,711.

Scintilla Magneto Div., Bendix Aviation Corp., Sidney, N. Y., plug-igniters, $157,500.

Kollsman Instrument Corp., Elmhurst, N. Y., machmeters, $338,164; spare parts for various instruments, $63,283; airspeed indicators, $108,923.

Rauland Borg Corp., Chicago, amplifiers, $315,997.

Boeing Airplane Co., Seattle, retrofit kits, $90,459.

Consolidated-Vultee Aircraft Corp., Ft. Worth, Tex., repair, rework and modification of GFP for modification airplanes, $200,000.

Vinco Corp., Detroit, machinery and equipment, $160,000.

Eastman Kodak Co., Rochester, N. Y., machinery and equipment, $425,000.

Interstate Engineering Corp., El Segundo, Calif., nose strut assemblies, $192,630.

Mine Safety Appliance Co., Pittsburgh, fire fighter protective hoods, $354,432.

Goodyear Aircraft Corp., Akron, Ohio, addition of fuel pump and float switch to aluminum fuel tanks, $133,628.

B. F. Goodrich Co., Akron, aircraft spare parts, $125,751; wheel and brake assemblies, $125,180.

Eclipse Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., valve & pump assemblies, $105,565; inverters, $567,050; accelerometers, $118,472.

David Clark Co., Inc., Worcester, Mass., anti-G suit valves, $305,033.

Allison Div., General Motors Corp., Indianapolis, turbo-jet engine spare parts, $5,150,000.

Wright Aeronautical Corp., Curtiss-Wright Corp., Wood-Ridge, N. J., rework engine cams, $114,552.

Sorenson & Co., Inc., Stamford, Conn., power units, $439,960.

U. S. Gauge Div., American Machine & Metals, Inc., Sellersville, Pa., releases, parachute ripcord, $905,850.

'World's Best' Weapons Produced By Ordnance-Industry-Science Team

NEW YORK—How on ordnance-industry-science team is working together to turn military requirements into "realities that have kept the American soldier the best armed and best equipped soldier" in the world was related to the winter general meeting of American Institute of Electrical Engineers meeting here Jan. 22-26 in the Hotel Statler.

Brig. Gen. Leslie E. Simon, chief of the Army Ordnance Research & Development Div., described to the nation's top electrical, electronic and nucleonic engineers a three-pronged approach to new weapons: (1) The "using arm," or officers of the Army field forces who study Army needs and formulate requirements; (2) the laboratories that exploit the basic science of ballistics; and (3) the engineering and design organization, whose job it is to take the requirements and the basic scientific data and turn out the practical article.

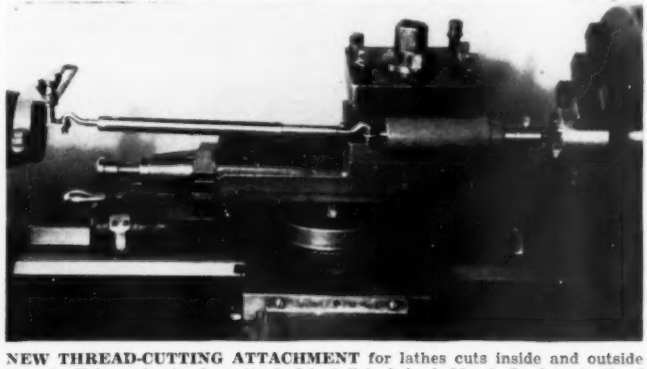
That article is seldom right in its first stages of development, the General said. "It has to be judged by the Army field forces, and then we have to try all over again—sometimes two or three times—and the article is still subject to further improvement after it is in production.

"We seldom get a weapon into production without feeling that we could make it still better if we could just start over again. We accept a weapon we regard as not completely satisfactory, screw our courage to the sticking place, and say we are going to freeze design at this point, and let the production people get busy and turn out actual weapons for our soldiers."

• **How to put polished metallic** finishes on non-conducting materials through a high frequency induction process was described at the meetings by Robert G. Picard and J. E. Joy of RCA Victor Div., Radio Corp. of America, Camden, N. J. The material to be metallized through evaporation is placed in a small crucible which in turn is placed within a metal coil, but not touching it. The coil is heated by induction. This has advantages over the directly heated filament machine, namely a more efficient coating process and reduced loss of metal, it was claimed.

New Cutting Tool Officers

DETROIT—The Cutting Tool Manufacturers Assn. has re-elected Emil Gairing, Gairing Tool Co., president. Walter Fuller, Fuller Tool Co., was elected vice president, and R. S. Spencer, Detroit Boring Bar Co., was re-elected treasurer. Directors named were: Gordon J. Birgbauer, Super Tool Co.; K. R. Beardslee, Carboloy Co., Inc.; J. I. Schultz, National Broach & Machine Co., and R. G. Michell, Eclipse Counterbore Co.



NEW THREAD-CUTTING ATTACHMENT for lathes cuts inside and outside threads. Telescopic stop-bar attached to tailstock by holder is fixed to depth of cut to be made. A heavy spring in body of tool-holder which also contains a sliding piston with a set-screw for holding the cutting tool, comes into action when the arranged depth of the cut is reached. The stop-bar arrests the movement of the cutting tool. The lathe saddle continues its motion without the cutting tool following. Device was developed by German firm of Wandsbeker Werkseug-Gesellschaft Beinhoff & Co. of Hamburg-Wandsbek.

C. G. Bigwood

W. A. Thorp

Edwin E. McConnell

Lewis S. Greenleaf, Jr.

Names in the News

C. G. Bigwood has been named vice president in charge of operations, L. S. Starrett Co., Athol, Mass. **W. A. Thorp** was named works manager. **R. E. Starrett, W. P. Metevia,** and **F. G. White,** were named superintendents, and **D. R. Starrett** was named chief methods engineer.

Frank W. Jarvis has been elected president, Diamond Magnesium Co., Painesville, Ohio, a subsidiary of Diamond Alkali Co.

John M. Yahres has been elected president, Pittsburgh Screw & Bolt Corp., succeeding the late **John P. Hoelzel.** Mr. Yahres has been executive vice president since 1937.

Edward J. Lilly has been named sales engineer, Butterfield Div., Union Twist Drill Co., to represent Butterfield in the Philadelphia and Baltimore areas with headquarters in Philadelphia. He was formerly with Simonds Abrasive Co.

Raymond D. MacDonald has been named sales representative, J. H. Williams & Co., Buffalo. He will represent the company in western and central New York State, northern Pennsylvania and adjacent Canada, working out of the firm's home office.

W. G. Andrews has been named executive vice president and general manager, Electrofilm Corp., Los Angeles.

J. W. Fauver has been named vice president, J. N. Fauver Co., Inc., Detroit. He has been a sales engineer with the firm for the past four years. **Ken Miller** was named Fort Wayne representative, serving northern Indiana and south central Michigan.

John H. Elliott has been named general manager, manufacturing, and **William C. Oberg,** manufacturing consultant, United States Steel Co., Pittsburgh. A year ago Mr. Elliott was named assistant general manager of operations for Carnegie-Illinois. Mr. Oberg was named general manager of operations in 1950.

Edgar L. McFerren has been named chief engineer, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., succeeding **K. F. Gallimore,** who will continue as a director and vice president and consulting engineer. **Fred C. Freund** was named assistant works manager, succeeding Mr. McFerren as assistant to **W. E. Rutz,** executive vice president and works manager. **Ray G. Commo** was named supervisor of personnel to head the Industrial Relations Dept.

Harlow H. Curtice, executive vice president, General Motors Corp., Detroit, was elected a member of the financial policy committee. **S. E. Skinner,** vice president in charge of the accessory group of divisions, was elected a member of the board and of the operations policy committee. **Arnold Lenz,** recently named general manager of Pontiac Motor Div., and **Jack F. Wolfram,** who succeeded Mr. Skinner as general manager of Oldsmobile, were elected vice presidents of General Motors and members of the administration committee. **Clarence Stanley,** financial staff member, also was elected a vice president.

W. P. L'Hommedieu has been named assistant Pacific Coast District manager for the Westinghouse Electric Corp. with headquarters in San Francisco.

Edwin E. McConnell, controller of Norton Co., Worcester, Mass., and **Lewis S. Greenleaf, Jr.,** formerly vice president in charge of sales of Durex Corp. and of Durex Abrasives Corp., were elected members of Norton's board of directors. **Thomas S. Green,** a Norton director for 13 years, has retired. Mr. McConnell, 16 years with Norton, also becomes a member of the executive committee, which he has served in an advisory capacity for the past three years.

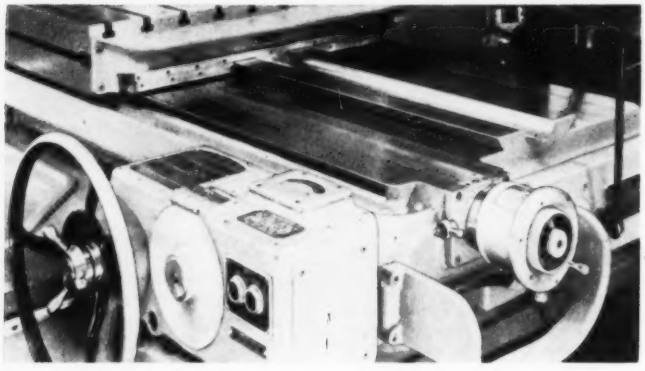
Gerhard E. Verstegen has joined the staff of equipment sales engineers of Hanson-Van Winkle-Munning Co., Matawan, N. J., to specialize on full and semi-automatic conveyors, with headquarters in Chicago. **W. M. Teets** has transferred from the laboratory staff to the sales force of the company with headquarters in New York.

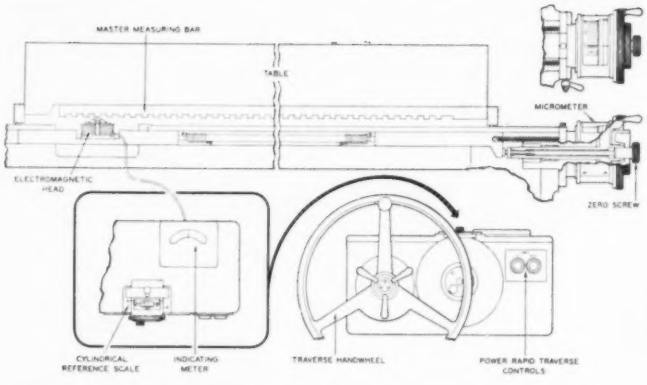
Howard E. Jenkins has been named manager, eastern territory, E. C. Atkins & Co., Indianapolis, with headquarters in New York. He was previously assistant sales manager and assistant to the director of sales, Nicholson File Co., Providence, R. I. **Lloyd C. Smith, Jr.,** has been named sales representative in Milwaukee, covering Wisconsin, Iowa, and western Michigan. **W. N. Springer, Jr.,** will serve the eastern Michigan area from the Detroit office.

Wayne Belden has been elected executive vice president, Ajax Flexible Coupling Co., Inc., Westfield, N. Y. **Charles Belden** was named vice president, and **Robert G. Cady,** sales manager.

Don Burleigh has been named manager, Machine & Foundry Unit, Diamond Match Co., Barberton, Ohio. He has been acting manager.

New Shop Equipment





Electromagnetic Measuring System Used in Pratt & Whitney Jig Borer

The No. 4E Jig Borer uses certain basic features of the P & W Electrolimit gaging principle to accurately locate large work under the machine spindle.

Basic 1-in. spacing is obtained from a master measuring bar by electrical means, without making physical contact. The master bar has rectangular projections which are calibrated, so that the distance between the magnetic centers of adjacent projections is precisely 1 in. within a tolerance of twenty millionths of an in. accumulated error in the full length of the bar. Two of these master bars are built into the machine at right angles with one another, one 60-in. long on the underside of the table, for positioning the table longitudinally, and one 36-in. long on the underside of the carriage, for positioning transversely. Beneath each master bar is an electromagnetic head, which detects the exact magnetic center of each projection on the master bar, as the bar passes over the head, and registers a zero reading on an indicating meter.

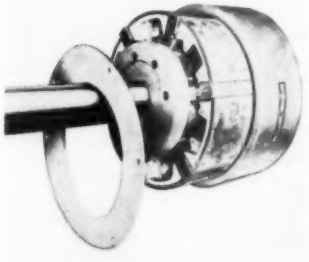
The basic one-inch spacing is further sub-divided by positioning the electromagnetic head between any two projections on the master bar with a high-precision micrometer screw. A large 4½-in.-dia. micrometer barrel, with wide-spaced graduations, permits easy reading for direct settings to 0.0001 in. A separate screw, within the micrometer screw, is used to zero the electromagnetic head under the nearest projection on the master bar, when establishing an initial zero position on the workpiece.

Cylindrical reference scales, which revolve as the table or carriage move, are used to rapidly locate the table to approximate settings. The scales read in either direction and are adjustable to set zero for a starting position.

To locate a hole, the operator simply sets the micrometer for the inch fraction and operates the power rapid traverse until the reference scale reads the approximate setting. Final adjustment is made by handwheel, the exact setting being accomplished when the indicating meter reads zero.

Pratt & Whitney, Div. Niles-Bemont-Pond Co., West Hartford, 1, Conn.

(MORE DATA? CIRCLE FYI 31, p. 187)



Centrifugal Clutch Coupling Can Be Easily Disconnected

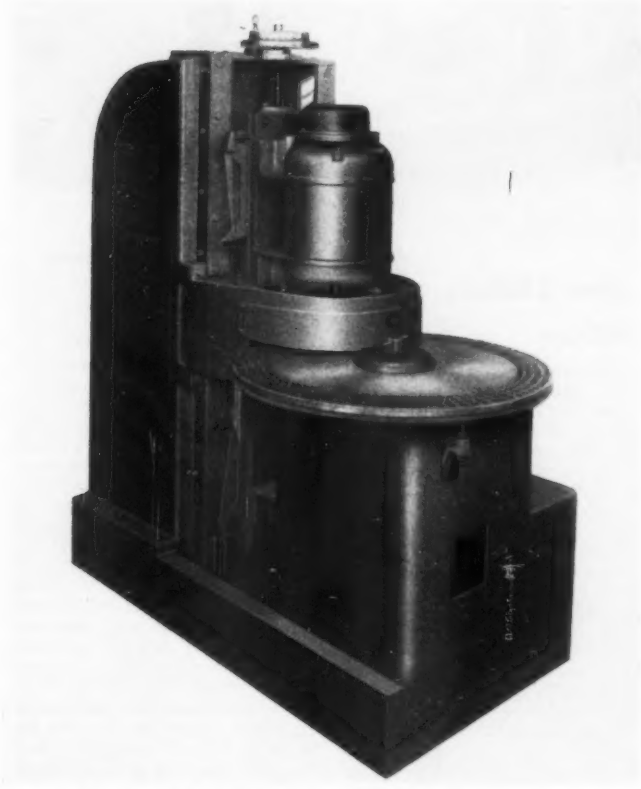
This unit was constructed to permit the moving of heavy equipment without disturbing both members.

This is how the unit works. The driving spider slides back over the driving hub far enough to clear the driven half of the coupling, thus permitting either member to be lifted clear of the other. The units are available for either Rawson coupling standard shoes or spring-controlled shoes and come in 9 sizes ranging from 6x2 to 24x8 inches.

Centric Clutch Co., 22-26 South Avenue, West, Cranford, N. J.

(MORE DATA? CIRCLE FYI 32, p. 187)

Materials and Parts



Gardner Flat-Surface Grinder Uses Solid-Center Disks

Double-disk grinding machine, designated as Model 2V-18, is used to grind two parallel flat surfaces on small workpieces in one operation. Parts such as small coil springs, carbon brushes, ceramic materials, and similar small parts can be economically finished on this machine.

Two 18-in.-diameter solid-center abrasive disks are each driven by 3- or 5-hp motors. These disks are each 2-in. thick. The 32-in.-diameter rotary work carrier is made to suit the workpieces. Fingertip speed control is provided for an infinite range of work carrier speeds between ⅛ and 1 rpm. A bayonet lock for the carrier permits rapid change of the carrier plate when changing work set-up or dressing the disks. An outboard bearing under the carrier gives extra stability.

Both grinding heads may be independently adjusted by means of graduated hand wheels. In addition, each of these heads may be tilted for progressive grinding.

The path of the workpiece is directly across the center of the disks. With this method, a solid disk may be used instead of the conventional type with a center hole. Savings in wheel costs are said to be considerable, as less frequent dressings are required.

The dresser mechanism is en-

...INCLUDING

Engine lathes have a total of 56 threads and feeds, and a rigid construction page 180

Toothed belt, to be used as a power drive, will not slip and permits precision timing page 181

Automatic screw machine produces three operations with simplified tooling and cams page 182

Milling-arbor flywheels have interchangeable bushings so that the flywheel fits a variety of arbors page 184

Punch presses have two adjustable-stroke ranges and come in three styles .page 186

Stud driver eliminates thread mutilation by applying pressure on top of the stud page 190

Spring chucks are self-centering and by using metal pads, eliminate expensive jigs page 192

NEW BULLETINS for your Shop Library, including a slide chart on stainless steels which gives an analysis table and fabricating data pages 187 and 188

... and in February 19

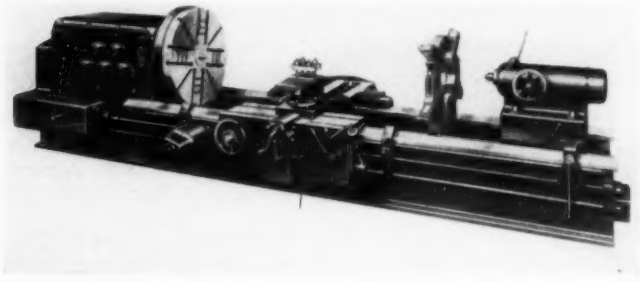
Vertical miller uses an eccentric motion to produce square holes and other unusual shapes.

Carbide-tool grinder uses a spring movement to carry the worktable and tool across the wheel face.

closed in the main machine column. It is hand-operated and fully adjustable for position. Dressing is done directly across the center of the disk so that no compensating settings have to be made when the heads are tilted.

The Gardner Machine Co., Beloit, Wis.

(MORE DATA? CIRCLE FYI 33, p. 187)



Niles Heavy-Duty Engine Lathes Feature Rigid Construction

Line of engine lathes has a total of 56 feeds and threads, produced by the quick-change feedbox without changing gears in the enclosed quadrant. The quadrant gears are maintained on the end of the bed to produce special feeds and threads. The lathes, ranging in size from 40 to 80 in. and up, are powered by either ac or dc motors.

A compensating V-way on the front bedway maintains alignment of the carriage on the bed. Adjustable tapered gibs in front of the compensating way and clamps underneath the bedways are provided to resist the tendency of the carriage to twist and climb the bedways due to the thrust developed during cutting. The carriage is of rigid construction and has a wide bridge which firmly ties the front and rear wings together.

Both power and hand longitudinal, cross, and angular feeds are provided for the carriage and compound rest, which supports the English-type tool block. A fine-toothed clutch, which can be snapped in and out without effort, engages all the carriage feeds. Hand-adjusting screws are equipped with micrometer dials for accurate positioning of the tool. A 1½-hp motor, mounted on the apron, permits longitudinal traverse without the danger of a rapidly revolving lead-screw.

The tailstock spindle, 6½ in. in diameter, has a travel of 12 in. Two binders, supplemented by the bracing action of the pawl engaging the cast rack in the bed, prevent any slipping under heavy loads.

Wherever possible, lubrication of the machine is automatic. A motor-driven pump on the headstock and another on the apron, with suitable piping to all bearing surfaces, lubricate both units. An independent lubricating system is provided for the feedbox and tailstock. Wipers on all sliding surfaces of the bed remove chips and dirt from the bedways.

Drive for the 40-inch lathe is furnished by a 40-hp. constant-speed ac motor, or a 3 to 1 speed-ratio dc motor. Floor mounted behind the headstock, the motor is adjustable to take up slack in the V-belts connecting the motor to the drive shaft.

Controls on the carriage start and stop the main-drive motor, set the directional rotation of the spindle and traversing the carriage. When the lathe is equipped with a dc motor, controls are also provided to operate a rheostat. Pump motors are controlled by pushbuttons mounted on the headstock, and additional buttons also provide a jogging motion to the speed change gears as an aid in shifting them.

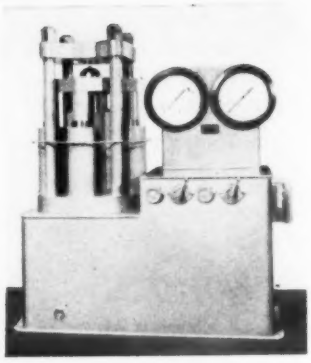
Niles Tool Works Company Div., Baldwin-Lima-Hamilton Corp., Hamilton, Ohio.

(MORE DATA? CIRCLE FYI 34, p. 187)

Anodes for use in electroplating of tin and for the new tin-zinc plating process are available. There are three types: pure tin, high-speed alloy-tin, and anodes for depositing a tin-zinc alloy that can be used as a substitute for cadmium.

Metal & Thermit Corp., 100 East 42nd St., New York 17, N.Y.

(MORE DATA? CIRCLE FYI 35, p. 187)



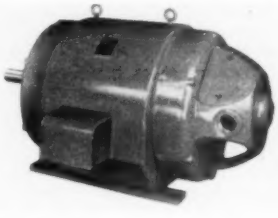
Ductility Testing Machine Employs a 5-In.-Dia Penetrator

The purpose of this unit is to detect surface and sub-surface imperfections in deep-drawing steel over a comparatively large area. The machine is motorized, hydraulically operated, and provides separate controls for clamping the sample and for regulating the penetrating pressure. The clamping pressures can be applied up to 100,000 lb., while penetrating pressures are provided up to 150,000 lb. Equipped with a set of three dies for use with different gages of metal, the machine will test material up to ¼-in. thickness.

It was felt that cup testing over a larger area would afford a greater opportunity of detecting imperfections. A short ⅞-in-dia extension on top of the 5-in. dia penetrator enables comparison with the ⅞-in. standard method. To aid in the evaluation of results, the area involved in a test is inscribed with a 1-in. grid which can be correlated to the grid pattern of drawn parts.

Steel City Testing Machines, Inc., 8843 Livernois, Detroit 4, Mich.

(MORE DATA? CIRCLE FYI 36, p. 187)



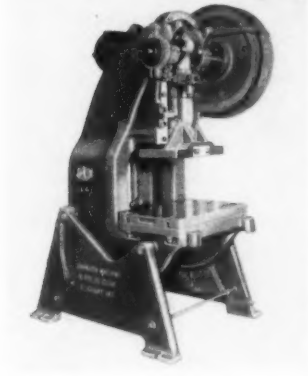
Heavy-Duty Wound-Rotor Motors Provide Variable-Speed Drive

These motors are advantageous on applications requiring high starting torque and low starting current, or long acceleration periods.

Built in ratings from 30 to 1500 hp., the unit illustrated is a 200-hp., 1750-rpm model. Drip-proof construction is furnished as standard on these motors with splash-proof or enclosed, forced-ventilation models also available. They are available with either ball or split-sleeve bearings to provide long-wearing qualities, and are easily accessible for inspection and maintenance. Brush pressure is adjusted with a ratchet-wheel tension adjustor which provides metered step-by-step increase or decrease of pressure on the individual brushes.

Electric Machinery Mfg. Co., Minneapolis, Minn.

(MORE DATA? CIRCLE FYI 37, p. 187)



Intermediate-Capacity Unit Added to Punch-Press Line

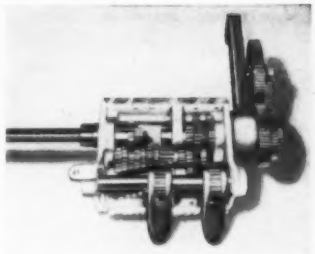
Johnson press is capable of exerting 43 tons pressure at the bottom of the stroke. This is a specially built press for die-cast trimming and light-sheet jobs. It is available in both flywheel and geared types.

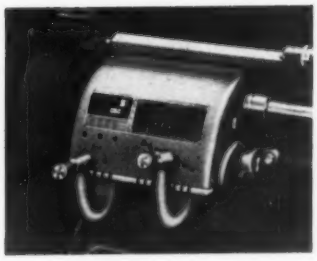
It has oversize side arms, a longer stroke, a greater bed area, and a larger ram face than most punch presses in its size range. The opening through the back of the press is 21 in., permitting clearance for exceptionally large work.

Known as the Model 44, it is powered with a 3-hp motor which operates at 1800 rpm. The gearing ratio is 5 to 1 and the back shaft has a speed of 230 strokes per minute. The ram is capable of 46 strokes per minute. Die space, bed to ram face, stroke down adjustment up, is 11½ in. Additional shut height up to 20½ in. is available.

The Johnson Machine and Press Corp., Elkhart, Ind.

(MORE DATA? CIRCLE FYI 38, p. 187)





Simplified Gear Mechanism For South Bend Lathes

Quick-change gear mechanism is claimed to save time and give long dependable service. It is being supplied on 16-in. swing and 14½-in. swing South Bend lathes.

It has a minimum number of parts and is fitted with ball and needle bearings. A direct-reading index chart shows positions in which the two tumbler levers are placed for each of 48 screw-threaded pitches, 48 power longitudinal feeds, and 48 power cross feeds. There are no sliding clutches or sliding primary end gears to change. Shifting a single lever changes feed instantly from coarse to fine, for roughing or finishing cuts.

Standard screw threads from 8 to 224 per inch are obtained simply by shifting the two tumbler levers on the gear box. The stud gear is changed for an additional series of coarse pitches ranging from 4 to 7 threads per inch. Provision is made for the use of special stud and intermediate gearing needed to cut metric screw threads, diametral-pitch worm threads, or other special screw threads. The regular gear guards are so contrived that they will enclose the metric or other gearing. No additional guards are needed.

South Bend Lathe Works, South Bend 22, Ind.

(MORE DATA? CIRCLE FYI 39, p. 187)

Timing belt installed on portable planer. Drive is more compact than gears, has no lubrication problem.

Toothed Rubber and Fabric Belt Will Not Slip or Stretch

Known as the Gilmer timing belt, it is claimed that this power drive will not slip and permits split-second precision timing. In addition, it will attain speeds up to 16,000 fpm, and is claimed to operate more quietly than precision gears running in an oil bath.

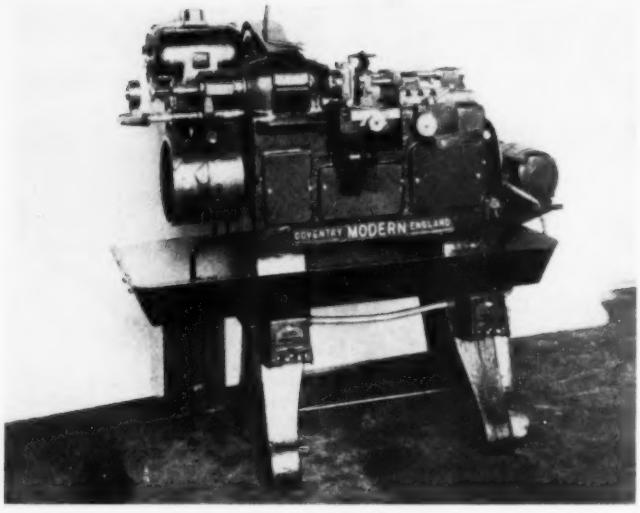
The belt is similar in appearance to a flat belt, except that it has regularly spaced rubber teeth along its inner surface which engage in corresponding grooves in the pulleys. It can be manufactured in any desired size, and in a variety of materials to suit specific applications. The company expects to offer a standardized line of stock drives in both heavy and light-duty constructions with a sufficient number of pulleys to give an adequate range of speed ratios.

The fact that it will not stretch permits it to operate on fixed centers without take-up adjustments. Since it needs no initial tension it has high efficiency with low bearing pressure. It requires no lubrication and is impervious to oil. Speed ratios are practical under certain conditions up to 30 to 1.

Basically, the belt contains either of two strengthening materials: steel for most power-transmission drives; and Ustex (a cotton cord chemically treated for high strength) for light drives. All neoprene compounds are used, except where there are extreme heat and oil conditions, which require Buna-N. A disadvantage is that the timing belt is more sensitive to misalignment than V-belts or flat belts. It is not, however, as sensitive as gears or chains.

United States Rubber Co., Rockefeller Center, New York 20, N.Y.

(MORE DATA? CIRCLE FYI 40, p. 187)



Cams and Tooling Simplified On Automatic Screw Machines

Tailslide feed up to	2½ in.
Cross-slide adjustment	1⅛ in.
Cross-slide feed	⅞ in.
Length of bar feed	10 ft.

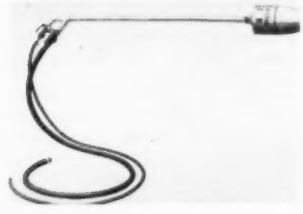
These machines come in two sizes, one having ⅞-in. and the other 1¼-in.-bar capacity. The ⅞-in. machine has standard 2 hp., giving 8 spindle speeds, 810 to 2500 rpm. The headstock spindle is mounted in two taper roller bearings.

It is capable of producing three operations with simplified tooling and cams. By limiting these machines to three operations only, the tooling becomes simple and easy to set up.

The camshaft is driven by a separate ½-hp motor, the control gear of which is interlocked so that it cannot be started before the headstock motor. It also shuts down when the headstock motor stops. Nineteen rates of feed are provided, giving cycle times of 0.084 to 1.81 minutes, or from twelve pieces per minute to one piece in two minutes. Final adjustment of all tool slides is with knurled micrometer pitch screws.

The price is said to be within range of any small shop.

DCMT Sales Corporation, 164 Duane St., New York 13, N.Y., Dept. ASM.
(MORE DATA? CIRCLE FYI 41, p. 187)



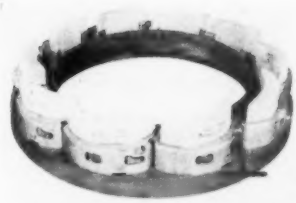
Hauck Portable Gas Torches Used With Any Gas Pressure

This torch is designed on a Venturi injector principle. The aspirating action of the compressed air thoroughly mixes the air and gas. The resulting high heating efficiency permits the use of gas at practically any pressure.

Built without coils, the torch requires no preheating or preliminary warming to start. It lights instantly and it burns steadily without ups and downs. It generates heat of 2700 F flame temperature and is not affected by wind. The flame of each size torch is adjustable over a wide range, from short minimum flame to the maximum heat output shown in the specifications.

Materials used are steel, cast iron, and brass. It is furnished with bronze gas and air cocks with union connections.

Hauck Mfg. Co., 124-136 Tenth St., Brooklyn 15, N.Y.
(MORE DATA? CIRCLE FYI 42, p. 187)

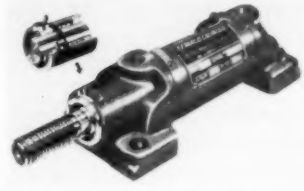


Segmental Grinding Chucks Put Out in Larger Sizes

These grinding chucks were first described in (*AM*—Oct. 6, '49, pg. 155) and have now been put out in several additional sizes. They are 22-, 32-, 34-, and 42-in.-diam. sizes for Thompson, Mattison and Blanchard grinders. An adapter plate is also available for Jowitt grinders.

The crescent-shaped bonded-abrasive segments are positioned to develop a combination plowing and centrifugal action which is reported to remove most grinding chips and dirt from the cutting path. The action is said to result in faster, truer cutting, less frequent abrasive dressing, and a finer finish than ordinary wheels of the same grain.

Abrasive Associates, 1216 Industrial Trust Bldg., Providence 3, R.I.
(MORE DATA? CIRCLE FYI 43, p. 187)



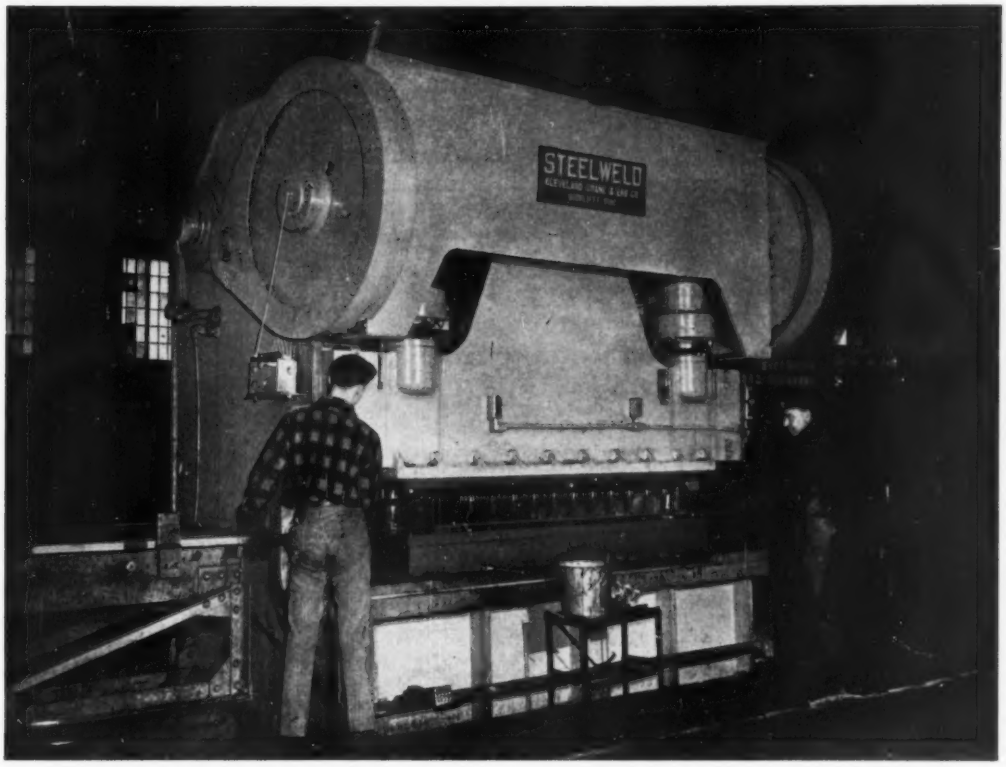
Packing Gland for Cylinders Complies with JIC Standards

Known as the Pemaco E-Z-Pak gland, this unit combines bearing surface, low-friction ram seal, and a seal-guard ram scraper into a single unit.

Ample bearing surface is provided by a bronze bushing on each side of the packing rings. Bushings arranged in this manner provide maximum packing life. Positive protection is afforded by a bronze scraper which excludes all external abrasives.

Replacement of the gland can be accomplished without dismantling the cylinder. The unit is manufactured for both hydraulic and air cylinders.

Petch Mfg. Co., P. O. Box 202, Mt. Clemens, Mich.
(MORE DATA? CIRCLE FYI 44, p. 187)



Model K5-8 Press, one of two Steelwelds in continuous 24-hour service since 1945, punching a series of holes in bridge floor bars.

2,000 Bars slotted every 8-Hour shift

Although originally conceived as machines for bending metal, Steelweld Presses are now serving a wide variety of uses. Two large Steelwelds at the MacDonald, Ohio Plant of the Carnegie-Illinois Steel Corporation are used solely for punching slots in steel bars, beams and T-sections for bridge flooring.

The time of one press is devoted largely to punching slots in bars 1⅝" and 1-7/16" wide by ¼" thick by 6'-2" long. Each bar contains 13 slots ½" wide by ⅝" to ⅞" long, and 24 slots ¼" wide by ⅝" to ⅞" long, a total of 37 slots all punched at one time. Two thousand bars are slotted in an eight hour shift.

Another standard job is that of punching 2-inch long slots on 4-inch centers in I-beams for bridge sections. These are punched 24 at a time. The beams vary in length from 24'-0" to 45'-0". Two hundred 40'-0" beams are punched in an 8-hour period.

Both Steelweld Presses have been in this service 24 hours a day since 1945.

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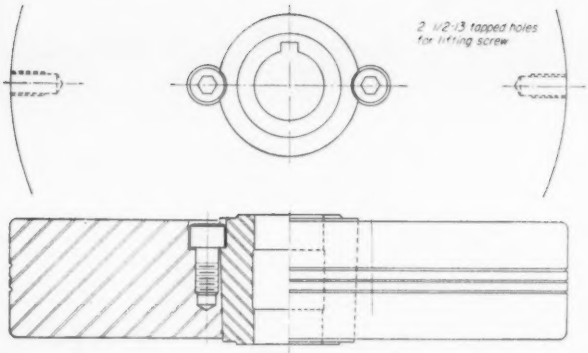

Interchangeable Bushings Provided For Milling-Arbor Flywheels

To make one flywheel fit a variety of milling arbors, interchangeable bushings are provided in this design. Thus disks of 10, 12 or 14 in. in diameter can be fitted with bushings to fit arbors of 1, 1¼, 1½, 2 and 2½ in. diameter. Bushings are a taper fit, and held in addition by two cap screws.

The standard set of four bushings (1, 1¼, 1½, and 2 in. arbors) is currently priced at $52 with individual bushings at $15 each. The 10-in. flywheel is $35, the 12-in. $40, and the 14-in. $45.

The disks are hardened steel, polished, and are used to provide flywheel effects directly on the spindle. The center portion of the bushing is grooved out so that it bears on the outer edges, preventing wobbling. One special type of disk has a hub recess to clear the spindle journal, providing more clearance.

Lovejoy Tool Co., Springfield, Vt.
(MORE DATA? CIRCLE FYI 45, p. 187)

PISTON GRINDER works on the cam-shaped skirt portion of automotive pistons. Maximum capacity is 5-in-diameter pistons with maximum length of 8 in. It can be arranged to operate on a semi-automatic cycle, thereby enabling one man to operate two machines. The wheel is 24 in. in diameter with 3¼-in. face.— ***Landis Tool Co., Waynesboro, Pa***
(MORE DATA? CIRCLE FYI 46, p. 187)

P&W Gage Classifies Parts In Increments of 0.0001 In.

The Pratt & Whitney Selectronic gage is a device used to classify critical tolerances of parts such as balls, rollers, pistons, and piston pins. It is said to permit broader production tolerances in the manufacture of such parts because it provides a selective control for precision fitting at the time of assembly.

Carbon vanes used in refrigerator compressor units are an example where accurate interchangeable assemblies of minimum tolerance are demanded. A thickness tolerance of 0.0032 in. is allowed, with the gage automatically separating the vanes into 32 classifications in increments of 0.0001 in.

In this instance, the vanes are loaded into a magazine-feeding mechanism from which they are automatically fed under an Electrolimit gaging head and subsequently routed into the proper classification bin. The gaging head operates a photoelectric control unit which registers the size of the vane according to its thickness and directs it to the ejection chute and then to the classification bin.

As each piece is gaged, an electric impulse passes through a commutator having 32 size-classification segments, and this actuates the chute-positioning mechanism. Only one set of masters, a minimum and a maximum, is needed to adjust the gage. Individual increment settings are not required.

The gages are custom built.

Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford 1, Conn.
(MORE DATA? CIRCLE FYI 47, p. 187)

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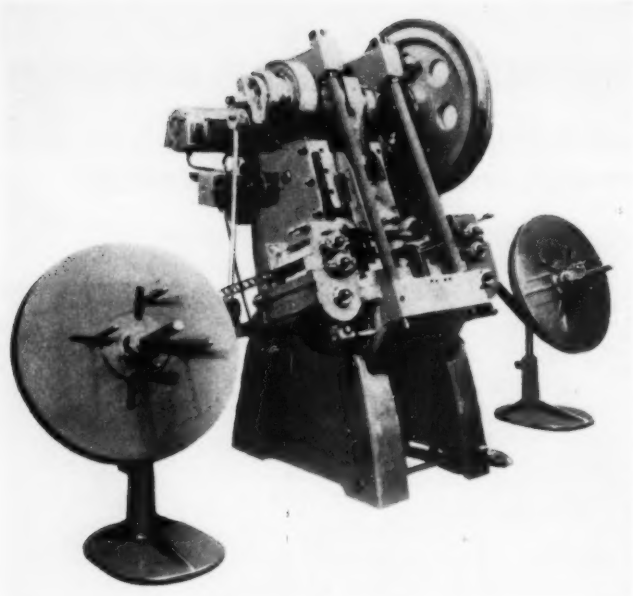
PHILLIPS HEADQUARTERS



Maust Punch Presses Have Two Adjustable-Stroke Ranges

These high-speed automatic presses, known as Hipromats, consist of three basic types of 30-ton capacity: open-back inclinable, open-back endwheel with fixed bed, and end wheel with adjustable bed and horn.

An adjustable stroke enables the presses to be used either as high speed automatics, or for conventional press jobs at lower speeds. The two adjustable-stroke ranges are: 12 lengths for high-speed operation with automatic feed ranging from 3/32 in. to 1¾ in.; and 12 lengths for single-stroke operation ranging from 5/16 in. to 3 5/32 in.

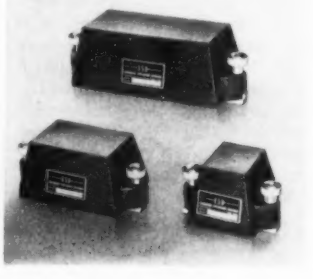
Other features include: a single-stroke, non-repeat oversized rolling key clutch and brake, adjustable for continuous duty; two hand-lever safety controls; releasing brake interconnected with clutch and treadle lock; and flywheel or single-geared drive. Single and double roll feeds are available for the presses.

The feeds for the inclinable press have three spring-loaded brakes; one each for drive shaft, lower feed roll, and the upper feed roll. A constant but adjustable roll opening prevents damage to roll surfaces. The cross-feed bar is placed inside the press frame, thus giving safe accessibility to tools while the press is in operation.

Auxiliary equipment includes a five-roll stock straightener driven by roll feed, pay-off stock reels and press-driven reels for rewinding scrap, and a shear-type scrap cutter.

Maust Machinery Corp., 85-36—212th St., Queens Village 8, N.Y.

(MORE DATA? CIRCLE FYI 48, p. 187)



Fixture Bases Simplify Mounting of Optical Comparators

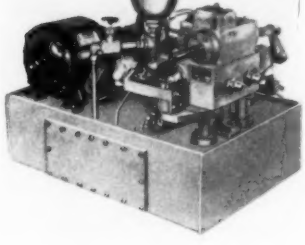
These improved fixture bases developed by ESD for the special staging fixtures built by them, are now available for use on American Optical projection comparators, Kodak contour projectors, and all models of Jones and Lamson optical comparators (except Model VC-14).

Available in 2-, 4- and 6-in.-long sizes, all bases are approximately 2½-in. high with ground surfaces top and bottom. Case-hardened locking keys are made to fit the standard work tables of the equipment named. A knurled lock screw at each end of the base insures quick and positive locking. The two locking keys are located off center with regard to the width of the base. The bases are thus reversible, the top surface can be placed so the work support surface is forward or back of the focal plane, as desired, by merely reversing the locking keys.

The under-surfaces are hollowed out. This gives clearance for screw heads which attach the work holding fixtures, or permits easy machining for underside bearing surfaces if slide type fixtures are desired. Approximately 1¼-in. thickness of metal in the top portion of the base permits machining keyways and slide screws, when required.

Engineer Specialties Div., The Universal Engraving & Colorplate Co. Inc., 980 Ellicott St., Buffalo 9, N. Y.

(MORE DATA? CIRCLE FYI 49, p. 187)



Hydraulic Flash-Welder Control Cuts Setup Time

A control known as Hydra-Flash has been developed for use with any make of flash welder, new or used, having transformer capacity up to 500 kva. It is a fully hydraulic unit with adjustments calibrated, making duplication of setups easy. It is claimed the range of cross-sectional areas that any flash welder can accommodate is greatly extended, and may be as great as 40 to 1.

The unit has been especially designed for the conversion of mechanically-driven flash welders to hydraulic operation. Only one limit switch is necessary to operate any standard welder.

Kingsley A. Doutt, 18465 Schaefer Highway, Detroit 35, Mich.

(MORE DATA? CIRCLE FYI 50, p. 187)

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NEW BULLETINS

MACHINES AND ATTACHMENTS

1 RADIAL DRILLS—*The Morris Machine Tool Co., Cincinnati 3, Ohio.* 16-page bulletin completely describes a line of radial drills. Includes specifications.

2 SURFACE GRINDERS — *Mattison Machine Works, Rockford, Ill.* 8-page bulletin 146-3RM covers the Hanchett-Type No. 36 rotary surface grinder. Gives specifications and shop shots.

3 SHAPER—*Delta Tool Div., Rockwell Mfg. Co., Milwaukee 1, Wis.* Bulletin gives details on a 7-in. bench-type shaper. Includes specifications, catalog listings, and illustrations of the features.

4 THREAD ROLLER—*D. H. Prutton Machinery Co., Cleveland 11, Ohio.* 4-page folder describes the Rollmaster, a planetary thread-rolling machine. Illustrated and contains specifications.

TOOLS AND ACCESSORIES

5 DIAMOND TOOLS—*Precision Diamond Tool Co., Elgin, Ill.* 16-page catalog gives a complete listing, by name, of manufacturers of grinding equipment, and the recommended diamond tools for use with their models. Also includes suggestions on the proper use of diamond tools.

6 POWER TABLE—*Niagara Machine and Tool Works, Buffalo 11, N.Y.* 12-page bulletin 85-A illustrates and describes a multi-drive power table for rotary sheet-metal work. Also includes a selection chart for picking the right machine for the particular operation desired.

7 CENTERS — *Ready Tool Co., 554 Ivanistan Ave., Bridgeport 5, Conn.* 4-page bulletin describing anti-friction ball bearing centers includes engineering data and prices.

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8 ELECTRIC TOOLS—*Buckeye Tools Corp., Dayton, Ohio.* Catalog features a complete line of 360- and 180-cycle portable electric tools. Includes specifications.

9 BROACH CARE — *Colonial Broach Co., Detroit 13, Mich.* 3-color poster chart lists the ten basic do's and don'ts of broach care.

HEAT-TREATING AND WELDING

10 PYROMETERS — *The Bristol Co., Waterbury, 20, Conn.* 56-page bulletin on thermocouple and pyrometer accessories lists many additional items and contains new data on the proper application and use of thermocouples.

11 FURNACE—*Leeds & Northrup Co., Philadelphia 44, Pa.* 4-page catalog section describes the new Series H Homocarb furnace equipment, with Microcarb control, which continuously and automatically regulates carbon content of the atmosphere.

PLANT-SERVICE EQUIPMENT

12 CONVEYOR BELTING — *Thermoid Co., Trenton, N.J.* 16-page bulletin covers all types of conveyor and elevator belting. It contains a discussion of the various types, suggestions for their applications, and selection charts.

13 LIGHTING—*RLM Standards Inst., Chicago 6, Ill.* 4-page chart shows whether or not a certain size and type of lighting is RLM-Certified; the names of manufacturers who make RLM-Labeled units; and those units in the process of being tested.

14 FORK TRUCKS—*Baker Ind. Trucks Div., The Baker-Raulang Co., Cleveland 2, Ohio.* 8-page bulletin illustrates and describes FT fork trucks of 3000- and 4000-lb capacity and 14 attachments. Includes specifications.

15 TRAMRAIL SYSTEM—*The Forker Corp., Cleveland 6, Ohio.* 4-page folder describes the Ohio Tramrail line of cranes, transfer bridges, and tramrail systems. It also carries a story on a shielded electrification system for safely motorizing cranes, etc.

16 TRUCK BATTERIES—*Gould-National Batteries Inc., Trenton 7, N.J.* 9 data sheets covering batteries to be used with a given make of "walkie" industrial trucks. A specification table on each sheet designates battery type, capacity, dimensions, and weight for each truck model.

17 MAINTENANCE — *United Laboratories, Inc., Cleveland 12, Ohio.* 6-page chart lists common maintenance problems and gives a solution for each. It lists over 100 products and processes.

PARTS AND MATERIALS

18 AIR MOTORS — *The Bellows Co., Akron, Ohio.* 24-page booklet illustrates and describes air motors and accessories. Also includes descriptions of "packaged" air units such as drill-press feeds.

19 BALL BEARINGS—*New Departure Div., General Motors Corp., Bristol, Conn.* The 20th edition of this catalog. Contains load rating tables giving both radial and thrust capacities, and selection tables giving bearing type and size for various conditions of load and speed.

20 STAINLESS STEEL — *Carpenter Steel Co., Reading, Pa.* Slide chart includes a standard analysis table of stainless steels, together with their AISI type and numbers, and gives relative fabricating data on the steels for a variety of operations.

21 SPEED REDUCERS — *The Falk Corp., Milwaukee, Wis.* 24-page booklet describes and illustrates vertical right-angle speed reducers. Includes: method of selection, hp-rating tables, torque-capacity tables, and dimensions among other information.

22 PUMP — *Allis-Chalmers Mfg. Co., Milwaukee, Wis.* 6-page folder describes the design and construction features of the Electrofugal, a close-coupled pump and motor combination with greater ease of maintenance.

23 SPEED REDUCERS — *Cleveland Worm & Gear Co., Cleveland 4, Ohio* 8-page bulletin describes typical applications of the company's speed reducers and drives and the equipment itself.

24 AIR VALVES — *Ross Operating Valve Co., Detroit 3, Mich.* 4-page bulletin describes ¼ and ⅛-in. 880 Series hand and foot valves. Includes installation data and engineering drawings.

25 STAINLESS STEEL — *Armco Steel Corp., Middletown, Ohio.* 4-page folder shows where stainless steel, 0.010 to 0.001-in. thick, has been used and outlines its manufacturing advantages.

26 POLISHING ABRASIVE—*Simonds Abrasive Co., Philadelphia 37, Pa.* 4-page bulletin describes Borolon abrasive grain for polishing operations. Includes grain-size recommendations.

27 FASTENER—*Elastic Stop Nut Corp. of America, Union, N.J.* 4-page bulletin deals with the Rollpin, an all-purpose pressed-fit pin with chamfered ends. The pin is slotted and compresses when driven in.

MISCELLANEOUS

28 PLASTIC MOLDING—*F. J. Stokes Machine Co., Philadelphia, Pa.* 24-page brochure covers fully automatic molding of thermosetting plastics. Cost savings by this method are described and typical applications are illustrated.

29 HARD TO SOFT WATER—*Penfield Mfg. Co., Inc., Meriden, Conn.* Folio contains 9 catalog sheets on ion-exchange systems for demineralizing raw water. Each sheet gives specifications and a working diagram of a particular model.

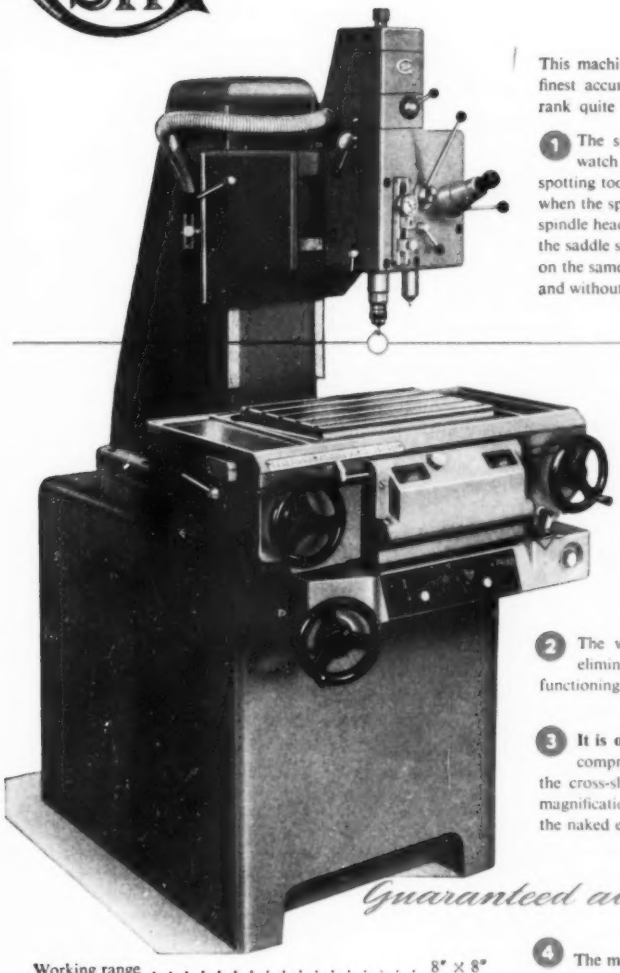
30 APPRENTICESHIP—*Bureau of Apprenticeship, U. S. Dept. of Labor, Washington 25, D. C.* 4-page review tells what apprenticeship is, the trades where the greatest opportunities lie, the qualifications necessary, and other information on this subject.

Announcing the new

No. 1H High Precision Jig Borer

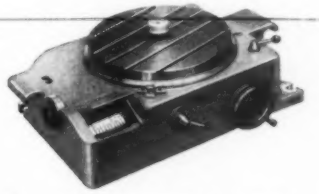
with optical settings

on viewing screens



This machine of new design is intended for boring work of the finest accuracy. It incorporates exclusive features which make it rank quite apart from the jig borers presently built.

1 The spindle head contains the three tools mostly used by watch and instrument makers: the boring spindle, a retractable spotting tool and a locating microscope (which can readily be used when the spotting tool is raised), both having a common axis. The spindle head can occupy two positions determined by abutments on the saddle slide. This permits bringing the three tools alternatively on the same spot of the workpiece by a single turn of a handwheel and without any dismantling.



The latest developments in optical design incorporated in the No. 1H Jig Borer are reflected in the construction of the accompanying PD-1H Optical Circular Dividing Table.

2 The work-table moves on precision guiding rollers which eliminate friction and wear of the ways and assures smooth functioning and accurate positioning.

3 **It is optically set** by means of a patented measuring system comprising two standard scales at right angles housed within the cross-slides and the graduations of which appear at a large magnification **on built-in viewing screens.** Readings are made with the naked eye to .0001 in. They are devoid of any parallax error.

Guaranteed accuracy: .00008 in.

Working range	8" × 8"
Table working surface	16" × 10"
Distance from table top to spindle head	11 3/4"
Spindle speeds	360 to 3000 r.p.m.
Boring capacity	1 9/16" dia.
Spindle quill travel	2 1/4"
Net weight	1900 lbs.

4 The measuring devices are totally enclosed and free from any wear or mechanical strain.

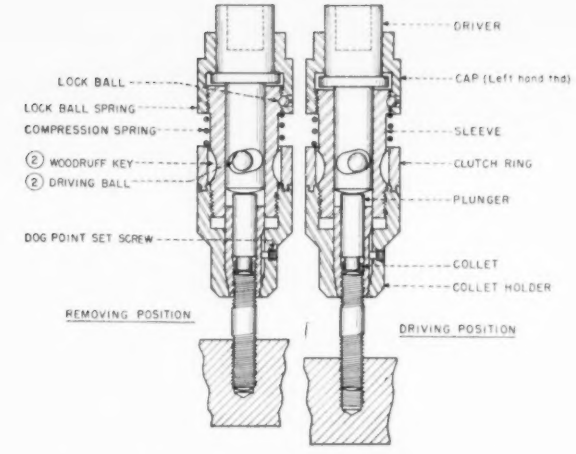
The permanence of accuracy is fully guaranteed.

The standard scales are enclosed in a hermetically sealed space so that the operator has the full assurance that nothing can interfere with the inherent accuracy of the measuring standards.

AMERICAN SIP CORPORATION

HIGH PRECISION MACHINE TOOLS AND MEASURING EQUIPMENT

100 East 42nd Street NEW YORK 17, N.Y.



Titan Stud Driver and Remover Eliminates Thread Mutilation

It is claimed that this driver eliminates mutilation and scraping of stud threads and distortion of cutter key holes due to the stud being driven by pitch diameter pressure instead of pressure on top of the stud.

Known as the AR series, the driver is equipped with either a T handle for hand use, or it may be used as a power tool. The driving member has ball grooves cut on a ¼-in. pitch. As motive power used is reversed, the driving member moves upwards instead of backwards, thus releasing pressure on the collet and freeing the stud. Due to a ball bearing construction, this releasing is done with a fraction of the amount of force necessary with other methods.

Adjusting the length of the collet grip on the stud is done by lifting the adjustable clutch ring and screwing the collet holder farther on the sleeve for a shorter grip or further off for a longer grip. This adjustment is positive and cannot move. Also, collets can be changed simply by lifting the adjustable clutch ring and screwing the collet holder all the way off the sleeve. The collet can then be removed from the holder.

Titan Tool Co., Main St., Dept. M, Fairview, Pa.

(MORE DATA? CIRCLE FYI 61, p. 187)

Elliptical Gears Cut On Standard Hobbing Machine

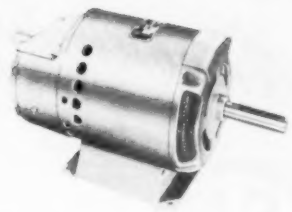
Elliptical gears can be cut with a special form hob on a standard machine with a standard setup. Although the value of elliptical gears has been realized for many years, it is said that there has been no means to produce them efficiently or accurately until this hob was developed.

The hob has a number of leads equal to ½ the number of teeth in the gear, each lead cutting two diametrically opposite teeth. Since the teeth are designed from a base ellipse rather than a base circle, even the involute curves on opposite sides of the same tooth are not similar. Thus, each thread on the hob differs from each other thread. The hob is topping so that the gears can be cut from bar stock, eliminating the necessity of locating the hob with respect to the work. These true involute teeth designed from a base ellipse produce the best possible rolling action.

The company will submit proposals for cutting elliptical gears with this hob.

Barber-Colman Co., Rockford, Ill.

(MORE DATA? CIRCLE FYI 62, p. 187)



Driven Member in Transmission Has Low Inertia

Vickers has designed a Magnaclutch transmission with two driving members and only one driven member. The two driving members rotate continuously in opposite directions, and a simple reversing drive which is controlled by energizing the proper excitation coil is achieved.

A feature is the single, low-inertia driven member. Because of the low-inertia property, there is no back lash in the output shaft. The gearing arrangement used to cause the driving members to rotate in opposite directions from a unidirectional input may not be limited to any particular ratio. For machine tools, for example, the gearing would be arranged to give a suitable cutting speed in one direction and faster speed in the opposite direction for return travel. The gear box may be omitted entirely and each of the driving members connected directly to separate sources of power.

Vickers Electric Div., Vickers, Inc., 1815 Locust St., St. Louis 3, Mo.

(MORE DATA? CIRCLE FYI 63, p. 187)

Warning Device for Air Lines

Airlarm is a low-pressure warning device which whistles a shrill alarm when the pressure in any compressed-air system falls below the minimum pre-determined pressure for safe or efficient operation of equipment. It is fully mechanical, automatic and self-contained.

The assembly consists of a valve element which springs open automatically when the air line pressure drops below the pre-selected volume. This allows escaping air to blow a whistle which is an integral part of the unit.

Airlarm, P.O. Box 13034, Houston 19, Texas

(MORE DATA? CIRCLE FYI 64, p. 187)

Tough drilling job got you *Trapped?*

USE the best tools to get out tough jobs. They save time and save production costs. Standard Red Shield Tools are tops—in material—design—construction.

Over 70 years' experience in the cutting tool industry can be put to work for you. Just give one of our *Standard* service men an opportunity to make suggestions. There's no obligation, of course.

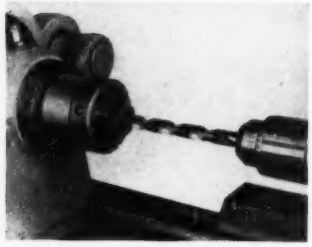
Industrial Supply Distributors in more than 529 cities across the United States stock and supply Standard Red Shield Drills—Reamers—Taps—Dies—Milling Cutters—End Mills—Hobs—Counterbores—and Special Tools.

Standardize on the Standard line. You will save time and costs—and get results.

STANDARD TOOL CO. CLEVELAND 14, OHIO

New York • Detroit • Chicago • San Francisco

THE STANDARD LINE: *Drills • Reamers • Taps • Dies • Milling Cutters • End Mills • Hobs • Counterbores • Special Tools*



Chuck in collet on turret lathe speeds production by automatically centering work and eliminating clamping.

Self-Centering Spring Chucks Reduce Direct-Labor Costs

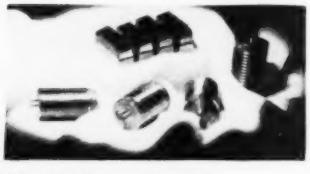
These chucks eliminate expensive jigs, and increase production of work on screw machines. They permit irregular shapes to be machined at considerably higher production speeds.

A light finger pressure will seat the work in the chuck. The four, spring-actuated chuck jaws automatically grip and center the work. After machining, only finger-pressure is needed for removal. There is no adjustment or any other operation required on the chuck between feeding pieces. Easy-to-make metal pads screwed to the jaws eliminate the need for costly jigs to handle irregular shapes.

Made of No. 1140 oil-hardening steel, heat-treated and stress relieved, the chucks are available in a complete range of capacities from ½ to 8 in. Prices, including one set of round and one set of square pads are between $59.38, for the smallest, and $307.38 for the largest chuck.

Self Centering Spring Chuck Co., 40 Summerfield Ave., Bridgeport 8, Conn.

(MORE DATA? CIRCLE FYI 65, p. 187)



Thread Chasers Tipped With Carbide Cut Costs

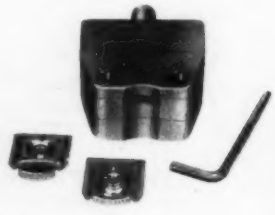
An innovation in the art of thread cutting deals with replacement of the cutting teeth by tipping the thread chaser with a material that can be classed in the carbide family, but which is more shock resistant. Grinding is accomplished with standard abrasive wheels.

Comparative tests are claimed to show increased thread finish, wear life, and cutting speed. For example: it is claimed a standard form, ½-in. thread can be cut on alloy steel with a surface speed of 150 fpm, with a Class-3 fit held.

Surface speeds of 150 to 300 fpm have been employed, with results indicating the lower speed to be the minimum in nearly all grades of material. Horsepower limitations on some older machinery are said to be only restriction on the most satisfactory results.

E. J. Deegan Mfg. Co. Inc., 725 E. 135th St., New York 54, N.Y.

(MORE DATA? CIRCLE FYI 66, p. 187)



Cunningham Marking Holder Fits Any Press

For marking the outer circumference of small-diameter parts, a periphery press holder has been developed by Cunningham. This Model PPH-10 holder is custom-made for each job, with the radius, size and number of characters determined by the piece to be stamped. The shank size is made to fit any press, and the holder will use regular straight-sided type, thereby eliminating the extra expense of the curved type normally used for marking curved parts. A removable plastic side plate holds the type firmly in place. The plastic is pliable and will compensate for slight variations in the body type.

M. E. Cunningham Co., 95 E. Carson St., Pittsburgh 19, Pa.

(MORE DATA? CIRCLE FYI 67, p. 187)

Valves Afford Fire Protection From Single Bank of Cylinders

To protect each of five or ten hazard areas with its own fire extinguishing system would be costly, and wasteful of valuable production space. Through the use of directional valves, it has been made possible for any plant to police and protect several hazard areas on a 24-hour basis with a single source of extinguishing agent. A supply source is used which comprises storage cylinders manifolded together for simultaneous discharge. The cylinder bank can be arranged in groups so that each of several hazards can be protected by an initial discharge group and a reserve group of cylinders.

The carbon-dioxide discharge pipeline from the cylinder bank connects to a directional-valve frame, where there is a valve for each hazard space protected. From the valve frame, a discharge line and a fire-detector connecting line goes to each hazard area.

Finally, in each hazard area are one or more fire detectors and a network of discharge nozzles.

Walter Kidde Co., 40 E. 34th St., New York 16, N. Y.

(MORE DATA? CIRCLE FYI 68, p. 187)

Yale Portable Hoist Uses Link Chain

Work positioning, hoisting, and stretching trolleys, telephone wire, and cables are a few of the uses suggested for this Pul-Lift.

It is claimed to be simple to operate and its light-weight construction makes it easy to carry to the job. At any point of the lifting action, the load is safely supported by a positive, self-actuating load brake. The top and bottom hooks open slowly without fracture when overloaded. The bottom hook is ball bearing mounted for swiveling. By using link chain the applications are said to have been multiplied. The model is available in ¾, 1½ and 3 ton capacities.

Philadelphia Div., Yale & Towne Mfg. Co., 11000 Roosevelt Blvd., Philadelphia 15, Pa.

(MORE DATA? CIRCLE FYI 69, p. 187)

Aluminum paint uses a silicon base and is capable of withstanding temperatures up to 1700 F. It is claimed to fuse with the surface metal upon application and to form a bright, elastic finish resistant to corrosion and moisture.

Speco, Inc., 7308 Associate Ave., Cleveland 9, Ohio

(MORE DATA? CIRCLE FYI 70, p. 187)

MAGNESIUM

high machining speed means more pieces per hour!

When it comes to machinability, you can't beat magnesium! Generally, the maximum rate of machining speed is limited only by the maximum speed obtainable on modern machine tools. This, of course, means more pieces per hour and a sharp cut in production costs. One source reported a 50% reduction in machining costs over the metal previously used.

Another outstanding machining characteristic of magnesium alloys is their ability to take an extremely fine finish. Surface smoothness readings of three to five microinches have been reported for finish turned magnesium. Finish grinding operations required on other metals usually can be eliminated.

Cutting tools designed for steel or brass may be used, but to take full advantage of magnesium's machinability, tool design should be slightly modified. It is suggested that relief angles be increased and clearance angles made larger to provide greater chip space.

Dow has over 30 years of experience in magnesium—a call to your nearest Dow sales office or a letter direct to Dept. MG-42 will put this knowledge at your disposal.

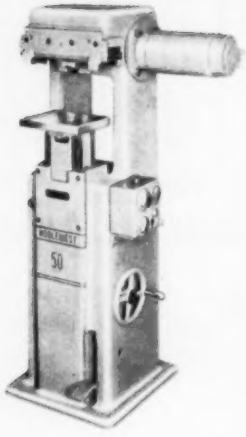
Smaller Chips—Closer Tolerances!

The free cutting action of magnesium produces well broken chips which do not obstruct the cutting tool or the machine. Extremely accurate parts with dimensional tolerances of only a few ten thousandths of an inch can be made by standard machining operations.

Magnesium Division, Dept. MG-42

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Atlanta • Cleveland • Detroit • Chicago
St. Louis • Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada



Pneumatic Marking Machine Produces up to 1200 Pieces Per Hr

These machines are known as the Noblewest 50 Series, and consists of three models — pneumatic, semi-pneumatic, and hand-operated. They are suited for trade marking, part numbering, codifying, and serial numbering on metal, wood, plastics and other materials. A roll-marking process is used, which is said to avoid shock to either the marking die or the piece being marked.

The all-pneumatic model is said to be able to mark up to 1200 pieces per hour. Both the table and die slide are powered independently by heavy-duty air cylinders. The machine is connected directly to shop lines. Only one air-control adjustment is needed in setting up the machine. This is a pressure regulator that controls the pressure of the table and so determines the depth of mark. Cylinder sequencing is automatic, regardless of the table pressure setting. No secondary valve adjustment is necessary after re-setting.

Noble & Westbrook Mfg. Co., East Hartford, Conn.

(MORE DATA? CIRCLE FYI 71, p. 187)

Jaws on Vernier Caliper Hardened to 55 Rockwell C

This chrome-steel, one-hand operated, vernier caliper is said to permit quick, accurate, direct-reading measurements. The jaws, blades, and depth rod are hardened to 55 Rockwell C.

The lower scale is graduated to 6 in., measures work up to $5\frac{7}{8}$ in. in vernier readings of 1/1000 in. The upper scale is graduated to 160 mms. and measures up to 135 mms. in vernier readings of 1/20 mm. Length of the jaws is $1\frac{7}{8}$ in. and they are $\frac{1}{8}$-in. thick. The tips of the jaws are beveled in front for measuring into slots or threads, and the back edges of the jaws are flat for measuring close into corners or narrow shoulders.

When the slide button is released by the thumb, the vernier slide locks itself at any measuring position in the upper gib instead of the lower section. In this way, the lower slide surface is always flush against the caliper shank regardless of pressure or release, since the pressure of the thumb or spring is in the same direction. The jaws therefore stay parallel. Cost for caliper and wooden case—$12.95.

Techno Exports, 15 Whitehall St., New York 4, N.Y.

(MORE DATA? CIRCLE FYI 72, p. 187)

Baker Fork Trucks Use Automotive Steering Wheel

An automotive-type steering wheel is used on these fork trucks of capacity from 3000 to 6000 lb. It is equipped with a knob to facilitate sharp turning and backing into position. The wide-angle steering axle is an all-steel knuckle type mounted in rubber blocks and pivoted longitudinally, providing accommodation to uneven roadways.

When driving the operator stands at the right side of the vehicle, a low panel permitting an unobstructed view of the work when engaging the load.

One pedal, operated by the left foot, controls power and braking. An interlock cuts off power when brake is applied. The brake is a mechanical air-cooled drum type, and is mounted on the motor shaft. Equalized braking action through the differential is provided.

Baker Industrial Truck Division, The Baker-Raulang Co., 1250 W. 80th St., Cleveland 2, Ohio

(MORE DATA? CIRCLE FYI 73, p. 187)

Grav-i-Flo Tumbling Machine Has Increased Capacity

With its two, 24 x 40 in. I.D. compartments, this tumbling machine is rated to handle a 30% larger work load than comparable machines occupying the same square feet of floor space. Other features are: compartments furnished with $\frac{1}{2}$-in. plate unlined or $\frac{1}{4}$-in. plate rubber lined. Doors have cam locks with manually released safety stops to provide pressure relief. A limit switch on the safety guard cuts off current to stop barrel rotation when the guard is lifted. The 220-440 volt, 5- hp motor has a magnetic break.

Other equipment and materials available for the process include: Super-Brite finishing chips which are rated to cut 25% faster on nonferrous metals; compounds which change chip surface from finishing to cutting in minutes; natural and synthetic de-burring chips for all metal alloys; and a motor-driven separator for removing chips from parts.

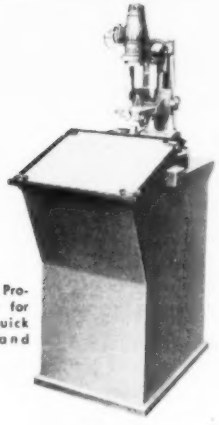
Grav-i-Flo Corp., 400 Norwood Ave., Sturgis, Mich.

(MORE DATA? CIRCLE FYI 74, p. 187)

Shifting sleeve for Ball-Lok clutch is said to simplify installation of the entire assembly. It is also said to reduce misalignment of the shift lever. When installed, a small, central extension of the clutch shifting ring is modified so that the thrust and pull of the clutch is borne by a small bearing. It can be actuated by solenoid or air pressure.

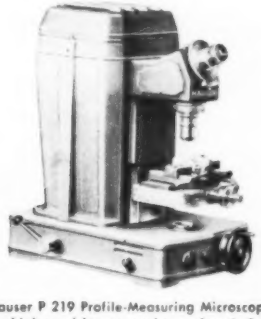
The V-Belt Clutch Co., 418 N. Western Ave., Los Angeles, Calif.

(MORE DATA? CIRCLE FYI 75, p. 187)



Hauser P 215 Profile Projector for easy and quick checking and measuring.

Hauser P 324
Measuring Machine for precision measurements with direct optical reading to .00005"—capacity 4 X 4".



Hauser P 219 Profile-Measuring Microscope for high-precision measuring and control of profiles on the basis of enlarged drawings.

3 PRIME REASONS WHY

Measurement and comparison problems find quick production answers in Hauser's great line of Optical Machines.

YOUR INQUIRY IS WELCOME

Put your inspection problems up to us, without obligation. We can still make some deliveries from American warehouse stocks.

DID YOU KNOW?
Hauser also makes the world's finest BURNISHING MACHINES. Ask for data on new Type 241.

HAUSER

MACHINE TOOL CORP.
AFFILIATED WITH
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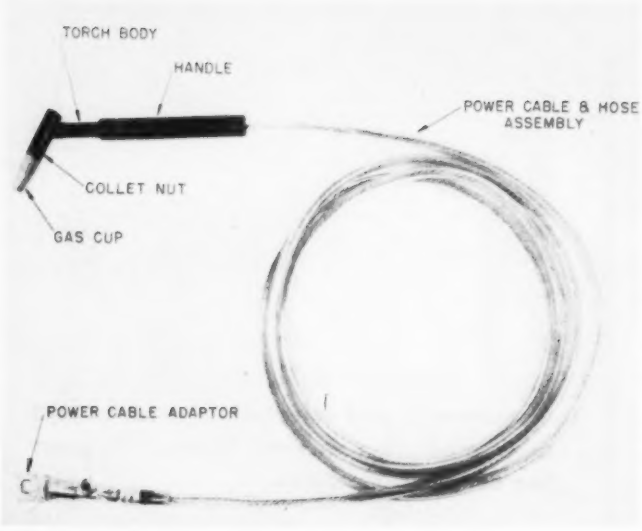
30 Park Avenue, Manhasset, N.Y. • Representatives in Principal Cities

Sole U. S. agents for Henri Hauser Ltd., Bienne, Switzerland—Jig Borers, Jig Grinders, Optical Measuring Machines, Profile Projectors, Burnishing Machines

At 30 Park Avenue, Manhasset, N. Y., is the widest selection of Swiss precision machine tools available from any one address in the United States. Represented here, in addition to Henri Hauser, Ltd., are Tornos Works, Ltd.; Schaublin, S. A.; S. Lambert, S. A.; Safag, S. A.; and Agathon, Ltd., which are handled exclusively by Carl Hirschmann Company.

SWISS *PRECISION CRAFTSMANSHIP* **SWISS** *DEPENDABILITY ACCURACY*



Linde Makes Light Torch for Inert-Gas-Shielded Welding

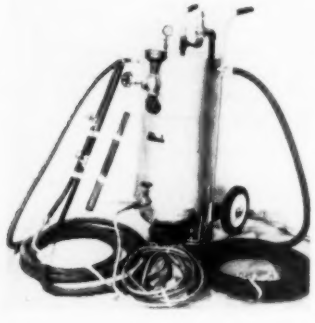
This torch has a two-position weldinghead and needs no water cooling. It has a maximum current capacity for continuous duty of 75 amperes and is designed for welding thin-gage materials.

The torch-head and handle assembly weighs only 3 oz. In normal welding operations the head is at a 120° downward angle from the handle. By interchanging the collet nut and torch cap, the angle of the head can be changed to a 60° backward angle from the handle. This permits making welds in tight spots.

Either 3-in. or 7-in. electrodes may be used. A single cable carries both power and gas, and is 12½ ft. in length. A 24-ft cable and hose assembly comes as an accessory.

The Linde Air Products Co., Unit of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N.Y.

(MORE DATA? CIRCLE FYI 76, p. 187)



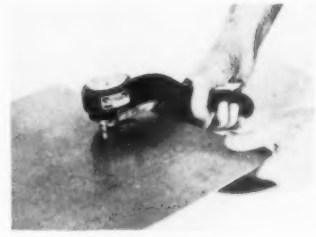
Livingstone Steam-Jet Cleaner Gets Steam From Supply Line

Known as the Speedy-Jet, this model includes a high-pressure detergent tank mounted on a light-weight all-metal dolly with rubber-tired 10-in. wheels and handle-bar grips. Twenty-five feet of steam hose for connection to the source of steam, and 25 ft. each of steam and detergent hose from the tank to the steam lance are included. It is equipped with a pressure gage, a 200-psi safety valve, and all necessary control valves. It is built under the ASME code and carries National Board stampings and Insurance Company certificate.

When operating, the tank is filled with detergent or solvent, and steam is admitted in the top of the tank to put the liquid under pressure. Detergent flows from the bottom of the tank through the detergent hose to the lance where it is atomized with the steam and directed against the object to be cleaned. Solvent, detergent, or paint stripper can be supplied either alone or mixed with steam in any desired proportion.

Livingstone Engineering Co., Worcester, Mass.

(MORE DATA? CIRCLE FYI 77, p. 187)



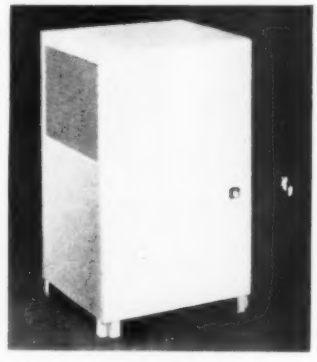
Portable Thickness Gage Uses Spring-Loaded Anvils

This gage is used for the rapid checking of sheet and strip stock. The measurement is transferred to the Model G81 dial indicator through the hardened-steel, upper and lower contact points. The wide-faced, spring-loaded upper and lower anvils grip and hold the gage perpendicular to the stock surface.

A retraction lever is built into the handle in the normal gripping position. The protecting lip at the front scoops and guides the stock into the gage. Chamfers on the anvils further facilitate entry of the stock. The indicator is graduated in 0.001-in. divisions.

Federal Products Corp., 1144 Eddy St., Providence 1, R. I.

(MORE DATA? CIRCLE FYI 78, p. 187)



Industrial-Fluid Cooler

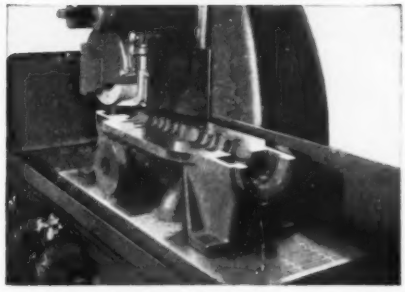
Used for honing, grinding, and cutting oils, this unit uses an air-cooled refrigeration cycle in cooling the oil or other liquid flowing through. The circuit is designed to provide a maximum heat transfer with a minimum pressure drop or flow restriction.

The coolers are built in standard models to handle most applications and in special models with explosion-proof construction for hazardous fluids and locations.

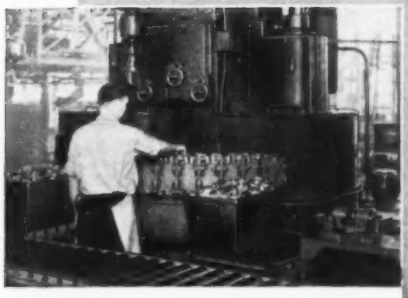
Frostrode Div., Viking Products, Wyoming, Mich.

(MORE DATA? CIRCLE FYI 79, p. 187)

WHERE THERE IS A FLAT SURFACE TO GRIND THERE'S A MATTISON TO GRIND IT.



40 hours before — now 4 hours. Pump case ground on Mattison Horizontal Spindle Precision Surface Grinder.



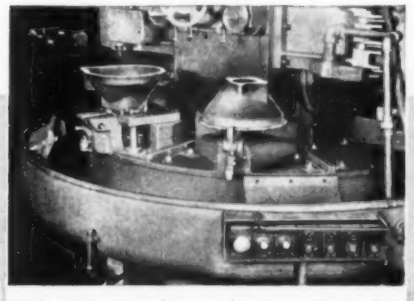
700 connecting rods per hour, using 40 station fixture to finish grind crank and wrist pin end of assembled rod with Mattison No. 72 Grinder.

With the addition of the production grinding machinery formerly made by the Hanchett Manufacturing Company, Mattison is now in a position to work with you on all your surface, face and disc grinding problems. These machines are made in various types to handle a wide range of work. Experienced engineers are available to give you best production efficiency, finish and tolerances, with Mattison machines.

For any flat grinding ask for our recommendations on the proper method and machine for your job. No obligation, of course.

For catalogs on any of the types shown or if you would like a copy of the general bulletin, let us know and we'll gladly send them to you.

Grinding Cast-Iron Cams — 5" diameter, 1⅛" thick — stock removal, each side .030". Production 120 surfaces per hour on Mattison (Hanchett Type) Rotary Surface Grinder.



200 Transmission Case surfaces ground per hour on Mattison (Hanchett Type) Rotary Automatic Grinder. A special 8-station mechanical fixture permits one operator to grind each end of this large 35 lb. casting, flat and parallel. Stock removal .050".

320 surfaces of cast iron compression heads per hour, removing 1/32" stock with Mattison No. 24 Rotary Surface Grinder.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

Compact Transformer Welder

Model MCX 200-amp welder is designed to cover a range of applications from sheet-metal jobs to heavy-duty industrial work.

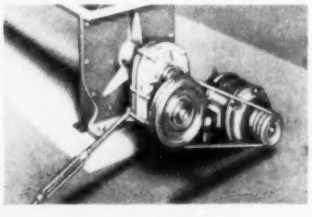
It has a 200-amp, 50% duty cycle, NEMA rating. Three current ranges selected by insulated tapered-plug connectors and infinite hand-crank adjustments provide currents from 30 to 250 amperes. This permits the use of 1/16- to 3/16-in-dia. electrodes.

Silicone insulation provides a high margin of safety two ways: it operates safely at high temperatures without breaking down and is water repellent.

An automatic hot-start control is employed, with a hermetically sealed gas-filled, time-delay relay, magnetic switch that has no open contact.

Air Reduction, 60 E. 42nd St., New York 17, N.Y.

(MORE DATA? CIRCLE FYI 80, p. 187)



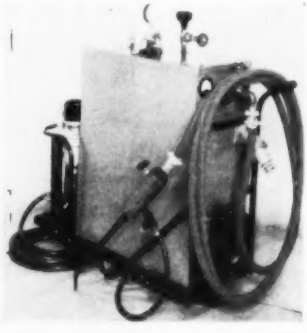
Dodge Shaft-Mounted Reducer For Output of 115 to 330 RPM

Claimed to be the first and only shaft-mounted reducer designed for this speed range, this single-reduction unit is being produced in four sizes, which cover capacities up to 27 hp. Ease and economy of installation are attributed to shaft mounting which eliminates special engineering, the cost of a foundation, flexible couplings, sliding base, and a time-consuming operation of lining up. The unit is locked to the driven shaft by means of two steel locking collars, one on each side of the reducer. It is anchored to the floor or any other fixed object by the torque arm. Accurate adjustment of belt tension can be made quickly and easily by operating the turnbuckle in the torque arm.

Any required output speed within the recommended range of 115 to 330 rpm can be obtained with stock sheaves properly related in sizes. Variations of that speed are accomplished by changing the sheave sizes.

Dodge Mfg. Corp., Mishawaka, Ind.

(MORE DATA? CIRCLE FYI 81, p. 187)



Steam-Jet Cleaner Has Built-In Boiler

It is claimed that this cleaner requires smaller quantities of solvents because they are not diluted by mixing with gallons of water at the jet. There is no danger from low water. The boiler water itself is the resistance heating element, and if there is no water, no current passes and no steam is generated.

Known as the JC-20, this model is all-electric, portable, and only 16-in. wide x 40-in. long. The boiler is built under ASME code, carries a National Board Stamp and is Underwriters' Laboratories listed. It is available for 220, 440 or 550 volts. The cleaner is rated at 20-kw maximum and under ordinary operating conditions consumes 15 kw per hr.

Livingstone Engineering Co., Worcester, Mass.

(MORE DATA? CIRCLE FYI 82, p. 187)

Hot-Working Die Steel Minimizes Heat Checking

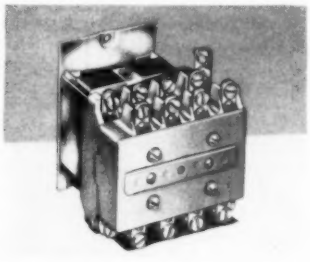
Die steel called Prestem is available in the form of solid press dies, insert dies, upsetter dies, and punches. It is said to possess the physical characteristic of developing a minimum amount of heat checking, and yet still resists the plastic flow of metal during press-forging operations. These attributes are said to be based on a precipitation-hardening phenomena wherein Prestem picks up temperature and develops an increase in surface hardness.

Other characteristics claimed include ready machinability at comparatively high hardness, a high impact resistance, and ability to be water cooled during press-forging operations.

The steel is available in three general hardness ranges. "A" hardness has a 2.95-3.10 Brinell B.D. with a 41-45 Rockwell C. The "B" hardness of Prestem has a 3.15-3.30 Brinell B.D., and a 36-40 Rockwell "C". The steel is also available in a prehardened, untempered condition, for customers' tempering after machining to a precipitation hardness beyond machinability.

Heppenstall Co., 4620 Hatfield St., Pittsburgh 1, Pa.

(MORE DATA? CIRCLE FYI 83, p. 187)



Convertible Contactor Produced in Small Size

Size 00 multi-pole convertible contactor, measuring only 2¾ x 2¾ in., is being produced. It is designated as the Type CRA and is said to provide instant circuit conversion without additional parts by means of reversible contacts. It is also said to save control panel space, simplify panel mounting, and reduce installation and maintenance time.

It has only four basic parts: a frame, containing magnet, coil, and patented right-angle mechanism; movable-contact unit; stationary contact base, and mat-finished contact cover plate. The contactor is being produced in two- to eight-pole types for requirements of 6 to 600 volts ac and 6 to 230 volts dc.

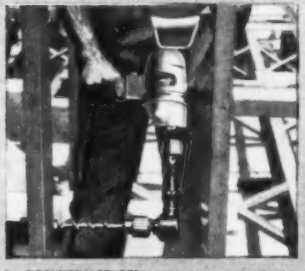
The Arrow-Hart & Hegeman Electric Co., 103 Hawthorn St., Hartford 6, Conn.

(MORE DATA? CIRCLE FYI 84, p. 187)

Have you a DRILLING problem that Black & Decker DRILLS can solve?

Here's how thousands of plants have used them to speed up jobs!

In MAINTENANCE — The versatile B&D Drill Line gives you hard-working drills for maintenance as well as production. They drive twist drills, wood augers, Hole Saws. And their husky construction stands up under the beating maintenance tools usually take.



In CONSTRUCTION—Whether you're building or modernizing, B&D Drills give you a wide selection. Big, rugged Drills for heavy-duty boring, like this B&D ½" Heavy-Duty model with right angle attachment. Small, compact ⅛" models for drilling lead holes in building cabinets, putting up shelves, etc.

In PRODUCTION—Dependable speed, power, stamina, easy handling make B&D Drills the top choice of thousands of production men. The powerful, compact B&D ¼" HOLGUN* shown here is a sample of the wide range of models and capacities you have to choose from.

WATCH a Black & Decker Drill on the job and you'll see speedy drilling, easy handling, trouble-free running. Examine its engineering and you'll find a powerful B&D-built motor, tailored for the tool; full ball-bearing construction; extra-tough gears, shaft and chuck spindle and husky housing. Check the B&D Drill Line and you'll discover an unmatched choice of 25 models in capacities from $\frac{1}{4}$" to $1\frac{1}{4}$" in steel, double in hardwood. A choice of handle arrangement for easiest operation. A choice of speed, power and price in most capacities.

That's why it makes sense to think of Black & Decker Drills first when you're up against a drilling problem. They'll save you time, money and man-hours. And as a *plus*, you get finest service for longer tool life from any one of 29 B&D-owned-and-operated Factory Service Branches. See your nearby Black & Decker Distributor for thorough demonstrations. Write for free catalog to: THE BLACK & DECKER MFG. CO., 616 Pennsylvania Ave., Towson 4, Md.

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B&D Black & Decker PORTABLE ELECTRIC TOOLS

WORLD'S LARGEST, MOST COMPLETE LINE

*Trade Mark Reg. U. S. Pat. Off.

Look who's sporting a halo!

More production . . . ground faster. That's why the foreman is so well pleased with himself . . . and with the rugged, stand-up performance of Simonds Abrasive Company resinoid bonded grinding wheels . . . real money savers on production operations . . . and part of a complete line including grinding wheels, mounted wheels and points, segments and abrasive grains.

Bulletin ESA 62 describes Simonds Abrasive Company resinoid bonded wheels. Let's send it to you, together with full information on our complete line and the name of your nearest Simonds distributor. Write for them today.

SIMONDS ABRASIVE CO.
grinding wheels

SIMONDS ABRASIVE COMPANY, PHILADELPHIA 37, PA. DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

ROUND TABLE Discussion

RATS NEST

STRICT adherence to the company's property rights need not cause trouble. In most modern shops we have the storeroom with storekeeper who hands out parts that are requisitioned. The requisition not only calls for stock or tools but also what they are used for. In small shops where they have no storeroom all parts could be locked up. Foreman, leader and, if necessary, a trusted employee could be given keys. When any employee wanted stock he would write out what he wanted and also what he wanted it for.

At one time I had the very same problem in the department. Left-over stock would not be returned to the storeroom and some of it disappeared. I called all the employees together and explained to them that much stock and many tools and parts were getting lost. I told them I trusted every employee in the department and that I needed their help and cooperation. They were asked for suggestions to cure this fault. This method of approach worked like magic and there were no more missing parts. It is in cases like this that, when the foreman loses his temper, he loses control.

A. E. Salmons
Philadelphia

•

FIRE OR FIZZLE

SHOULD the personnel department retain the services of a man who has been fired by his foreman and place him with a foreman of another department, in the hope that a change of work and foreman will yield better results? In a large works with numerous sections, it is no exaggeration to state that this problem is productive of more headaches than almost any other, concerning production efficiency and shop discipline. To arrive at a decision on this matter one is torn between conflicting desires: (1) To make certain that the man is not harshly treated. (2) To preserve the foreman's authority and dignity as a trusted servant of the company, not merely as just the foreman of a given section or department. Because of the responsible nature of the foreman's position, it is in this wider sense that we must regard him, bearing in mind that if good workers are scarce, good fore-

FIRST LINE OF DEFENSE

America's Great Production Machine—once again the arsenal of democracy—runs on oil and grease. And, among buyers of industrial lubricants, Socony-Vacuum is the *first-choice supplier!* Here's why . . .

Famous Gargoyle lubricants are unsurpassed in quality—constantly improved by Socony-Vacuum research. They are backed by 85 years of lubrication experience . . . are recommended by more machine builders than the products of any other oil company. Performance records, in thousands of plants, prove they help increase production, reduce friction and power losses, lower maintenance costs.

Socony-Vacuum—with more lubrication engineers serving industry than any other oil company—can help improve production performance in *your* plant. Why not give us a call?

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Correct Lubrication

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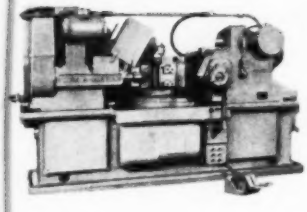
SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY • GENERAL PETROLEUM CORPORATION

No second operations necessary on the NEW



GOSS *and* DE LEEUW
CHUCKING
MACHINE

When any of the various functions for which this machine is designed are performed on it, no further machining is required. The job is finished.

The basic "1-2-3" method-exclusive with Goss & De Leeuw—provides for gripping work in the chuck and machining all ends either simultaneously or in sequence. By eliminating several handlings and set-ups, the "1-2-3" method produces finished pieces at a fraction of the time and cost ordinarily required.

Send samples of your work for time estimates. Ask for illustrated literature containing detailed information.

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QUALITY · PRODUCT · QUANTITY

GOSS *and* DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

men are infinitely more difficult to find.

Evaluation can save good workers for a company but no honest evaluation can condone blatant insubordination. If good discipline is to be kept in industry, calculated insubordination is inexcusable. If a man is convinced that he is being unfairly dealt with and cannot convince his foreman of that conviction, there is no call for revolt. He can ask for his case to be examined at a higher level and his foreman cannot refuse. In dealing with such cases, it often seems to me, most people conclude that between man and foreman, only the foreman has responsibilities. That, of course, is all wrong, since the man is responsible for his own good behavior, and insubordination is not good conduct.

General inefficiency was the second count on which "Ed" dismissed "Potts." As inefficiency in one section does not presuppose inefficiency in another department, there was scope and to spare for the constructive activity of the personnel team. No personnel officer should, however, fix a dismissed employee in another section without first talking the whole matter over with the foreman responsible for his dismissal. This is only fair, since he, presumably, reviewed the situation with the man before transferring him elsewhere. If the personnel people had taken this course in the case under review it is just possible that that discussion would have revealed faults on both sides, resulting, perhaps, in "Ed" admitting the fairness of giving the man another job with-

"I know it sounds silly, but the specs called for a squirrel-cage motor drive"

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TAPS and GAGES
NOW STOCKED

by INDUSTRIAL DISTRIBUTORS

To better serve our customers in their own territories, Hanson-Whitney Taps will now be merchandised thru a national set-up of Industrial Distributors. Standard sizes and types will be stocked in important tapping centers for fast delivery to more users, over a greater area.

During 1951 we shall back up our Distributors with H-W advertising in 8 publications reaching 1,587,600 readers. We have a new, sturdy, attractive, clearly marked package. Dealer helps will be supplied from time to time . . . and every effort will be made to insure better tapping results at lower costs . . . with recommendations from H-W engineers on request.

Gages may not be completely stocked in the field, but all standard sizes are available for immediate delivery.

NEW TAP PACKAGE

Colorful blue, black and white packages are easily identified on the shelves. Size and type figures are clearly marked. Taps are separated in the metal-edged box and further protected with an outside shipping carton.

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Hanson Whitney
PIONEERS OF FINISHED TAPS

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PROVE THE VALUE OF

Sibley's Model C-20 Drilling Machines!

Nothing demonstrates customer satisfaction more than repeat business—and judging from the repeat orders for the Model C-20, customers have found it to be a real cost and time saving investment.

On the market now for two years, this 20" swing machine has been tested in toolrooms and on production in hundreds of plants—and customers acclaim it as the finest drilling machine for its capacity they've ever operated.

There are good reasons for this acceptance! Operation is so effortless—geared power feeds are selected by turning a knob; spindle speeds range from 65 to 1360 R.P.M.; its capacity of 1¼" in mild steel handles a large variety of drilling jobs.

2 TO 3 WEEKS DELIVERY!
No lengthy waiting for your order.

OTHER SIBLEY MODELS
Model E-25 medium weight with 25" swing and ¾" capacity in mild steel. Heavier Models D-24 and D-28 in 24" or 28" swing with 1¾" capacity.

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in the organization. Were that point reached, "Ed" could not feel sore since he would then be a party to the transfer. Busy, sometimes overburdened foremen cannot always be bland and smiling. Like the rest of mankind they have their "off days" and a hasty word here or there can do immense harm. Similarly with the workman, if the job does not suit him, if he is a round peg in a square hole he is likely to feel raw, especially if his foreman, on an "off day," has been somewhat short with him.

All of the foregoing tangle could easily have been straightened out by tactful handling on the part of the personnel officer concerned, but his attitude seems to have been provocative rather than tactful in that he did not discuss with Ed, Ed's evaluation of the man, before placing him elsewhere in the works. If, after examining his evaluation, Ed honestly considered that disciplinary action in the form of dismissal was called for, no placing of the dismissed man should take place without the fullest investigation at a higher level, at which investigation Ed and the man would be given an opportunity of stating their case.

The foreman's job is notoriously difficult by any standard and any action on the part of colleagues or superiors likely, even remotely, to undermine his authority is bad for industry as a whole and cannot be too strongly condemned. If proper consideration were given those points, the question "should Ed tip off Ben," to whom the man was transferred would not arise. In any case, Ed need not go out of his way to "tip off Ben." It would be more dignified and effective not to. His aim was to be rid of a rebellious incompetent. Having achieved that, there would be no point in flogging a dead horse. To pursue the incompetent to his new job would neither profit nor satisfy a fair-minded foreman. If at the second time of asking, the man showed the same characteristics, the personnel officer's duty would be clear. If, on the other hand, he gave satisfaction in his new job, Ed might consider examining his own methods, afresh.

C. D. Mackinnon
Airdrie, Lanarkshire, Scotland

•

I DON'T like Al's action in lounging into Ed's office and running out again. When doing so, Al looks to me like a naughty boy, and I don't think this is the way any executive should act even if the issue is such

STOP downtime and expensive repairs on

hydraulic

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MACHINE TOOLS
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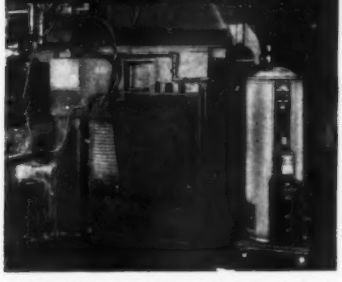
INJECTION MOLDING MACHINES
BALERS, ETC.

Honan-Crane Hydraulic Oil Purifiers prevent excessive wear of hydraulic pump parts . . . prevent the clogging and sticking of control valves, pistons, and other hydraulic mechanism . . . provide longer safe use of hydraulic oils . . . greatly reduce oil consumption.

Honan-Crane Gives You the Exact Solution for Your Problem

Mobile Purifiers for Group of Machines



A typical installation is illustrated by a Honan-Crane Mobile Purifier No. 14300, with pump and motor, which purifies 675 gallons of oil in nine Hydro-tel machines at Champion Machine and Forge Co.

Individual Purifier for Single Machines

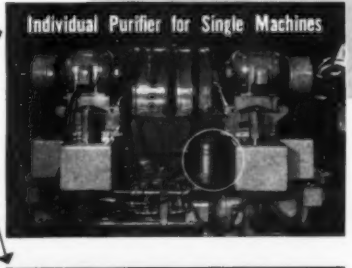


Illustration of Honan-Crane Purifier No. 711 direct connected to Norton Twin-O-Matic Grinder at Kaiser-Frazier Engine Plant.

Central Systems for Group of Machines

Honan-Crane Model 24360 Purifier used to keep oil clean in a 2,000 gallon central system at Macklin Company.

also... Honan-Crane Purifiers for the purification of quenching oils. Many major companies such as Borg-Warner, International Harvester, Salisbury Axle, Cleveland Graphite Bronze, etc., find that purification of quench oils:

1. Greatly lengthens life of oil.
2. Prevents build up of contamination and loss of efficiency in coolers.
3. Provides easier cleaning of quenched parts.

also... Honan-Crane Filters and Clarifiers for oils and coolants used in metal working operations. Removal of dirt, chips, etc.:

1. Cuts down rejects.
2. Lengthens tool and wheel life.
3. Cuts down maintenance on machines.
4. Greatly reduces cost of oils and coolants.

Write today for complete bulletins on the purification of Hydraulic Oils and the Filtering of Metal Working Oils and Coolants.

Honan-Crane Corp. 205 Wabash Ave., Lebanon, Indiana

Subsidiary of HOUDAILLE-HERSHEY CORP.

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cutting power
and
long mileage

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Every day RED COAT BRAND ABRASIVES are becoming better known to more and more manufacturers who are highly selective in the materials they use.

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an "insignificant" thing as a man being fired and re-hired.

If Ed had been successful in getting Potts outside the factory, Potts might be frothing at the mouth too, and perhaps with better reason than Ed is able to put forth.

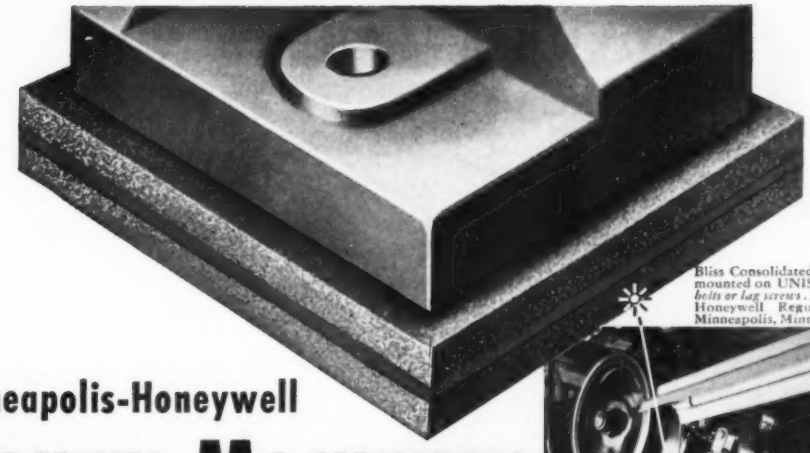
I used to think that any foreman must be the supreme commander of his department in order to be able to enforce discipline, but I have changed my mind since I found how some of them abused their power. Their is no reason why Ed should be burning up. By making such a statement he reveals himself as the dictator he really is. If he did not like to see the man he had fired in another department, it looks to me as though he wanted to punish him twice for his inefficiency. Supposing Potts regretted his insubordination and wanted to do better, then Ed would deny him that opportunity. This must be wrong. I suggest that Potts gets another chance. If he fails again then it is perhaps best for both parties to separate.

Is not that what the "separation interview" is for? Of course, and I think it is one of the best principles introduced in recent years. It is a check on foremen who take their duties as lightly as Ed when handling men, an attempt to place man before discipline, which must be an advance in the right direction.

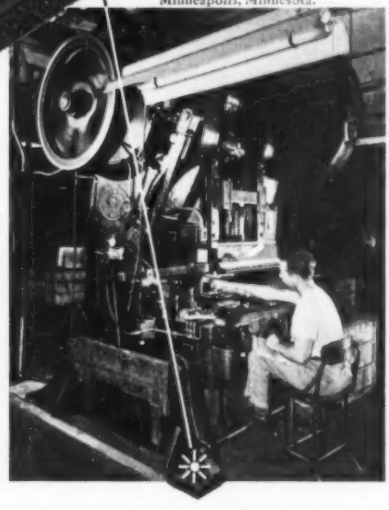
How does Ed know that Potts is no good and a bum worker when he has not even given him two chances? If I was in Ed's place I would, besides giving him two chances, try him out on several different jobs.

Ed does not seem to understand

"They're a foreign mission who want to modernize their defense weapons with precision steel arrowheads instead of bamboo"



Bliss Consolidated #8 Punch Press mounted on UNISORB . . . *without bolts or lag screws* . . . at Minneapolis-Honeywell Regulator Company, Minneapolis, Minnesota.



Minneapolis-Honeywell

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. . . Drilling avoided . . . floors saved!

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TRANSMITTED MACHINE NOISE AND VIBRATION REDUCED 60% to 85%
Lowers machine and building maintenance costs.
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Old-fashioned, destructive floor drilling eliminated.
Saves installation time as much as 80%. Labor costs reduced.

Maintenance on machine mounting practically eliminated.

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COMPANY NAME .....

STREET .....

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that the time is gone forever when the foreman was looked upon as a policeman whose main duty it was to watch every step of his men and fire those whom he thought he could do without almost for no reason at all, yeah, even for the looks of his face, which I know has happened. It seems to me that Ed is taking the attitude that if he cannot kick any of his men in the behind without interference from the personnel department, conditions are unbearable. He wants to be the strong man at the place. I wonder if he expects favors from the higher ups in taking that attitude? If so he is out of date.

If Ed, as I see it, has disregarded his duties towards his fellow man, I think the worst mistake he can do is to tell Ben about Potts. This does not give Potts an even break. It looks to me like pure persecution.

A. E. Fristedt
Stockholm, Sweden

•

WHAT'S NEWS

A PLANT publication isn't worth the paper it is printed on unless it gives the worker a lift—that lift we all feel when our spirits are raised by stories of personal interest. Let us be on our guard, though, that personal information does not delve into the privacy of an individual or that fellow's ire might rise to dangerous heights.

An occasional item, written expressly for company interest, does no harm if not laid on too thick and possibly it may do some good. I'd go easy on these, however, to maintain worker confidence.

There are those, unfortunately, who become very suspicious of the company's attempt to influence unduly, and editorial tact should be exercised in placing anything before them that savors in any way like propaganda. An editorial, done by the "big shot", occasionally could be utilized to advantage in bringing to the employees' attention some company plans that might be of immediate interest. Workers, if they are of normal mentality, know that the progress of the company results in the advancement of their own welfare. There should be no need of bringing this to their attention as there are some who rebel at obvious information being placed before them.

The department head has a pretty good perspective of what may be of interest to others outside of his department and he could, with very little effort, concoct a small item occasionally that would inform them

What do *you* want to know more about?

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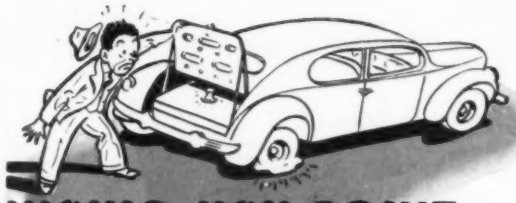

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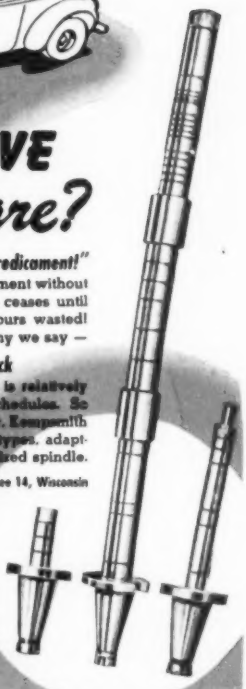

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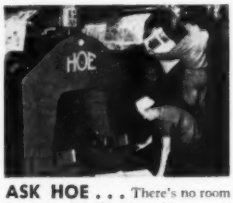

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what was going on. I think I would go a little farther and stress the advantage of having the janitorial staff contribute regularly—they dig up lots of dirt around the plant.

Jack Everett
San Francisco

•

WE CAN always learn something from the other fellow and he in turn learns something from us. We all like to know what makes the other fellow act the way he does. If we want the other person to be interested in us we must be interested in him.

The shop magazine is the best way I know to get the other fellow's point of view and to then compare it with our own angle. The plant magazine could very well be a center of common interest. It is a good idea to have the foremen write articles for it. It would make them feel they belong and are a part of it. The foremen would get an idea on what goes on in some other departments and many new ideas brought to their attention.

Many of these ideas could be adopted as general practice. We must be sensible of merit. To be sensible of merit, recognize it, treat it well—steps few of us take promptly. The foremen should be glad to express their opinions in the plant magazine. They do not have to worry if some people do not recognize their merits, but they would be foolish if they failed to recognize theirs.

A. E. Salmons
Philadelphia

•

ANYTHING is news that will improve the understanding and morale of workmen to the end that the quality of the product which they are making is not too great a price to pay when it is necessary to prove to the world that American workmen are the very best to be had.

Not only are most of them interested in their pay enevolpes but they are interested in the goods which they produce and in the welfare of their employers and the plant in which they work.

Many men learn to really think while they are writing and this is good for all concerned; yes, and the written word induces men to express themselves as they have never done before. Many of them find that it gives them a mental stature which places them in the ranks of real thinkers and they become doers of better work as well as they become better thinkers.

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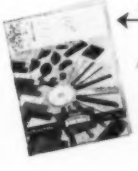

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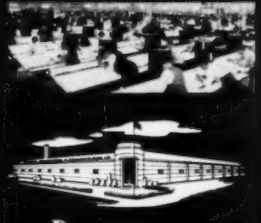

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INQUIRIES PROMPTLY ANSWERED

and sometimes magazines periodically, which, in many cases are called "house organs." These publications have been the means of pepping up many departments throughout the entire plants as well as to give ideas in regard to safety and welfare. Many of them appear to do much good and none of them are at all harmful except to such grouches as Ed is.

As a rule, foremen know more about the goings on than any other group of employees in a plant, and why shouldn't they? They hear the optimism of the men who work with them and generally they hear the others too.

Take an actual case: Bill Smith worked two lathes. On one he made the rough cut and on the other he did the finish. Bill got the idea that he could make two rough cuts at the same time and could do the finish on a much more rapid and lighter machine and so save time. Bill's idea was tried and it worked to perfection. His foreman wrote this up in the plant publication, and it attracted quite a bit of attention. Bill received a nice bonus, the firm was benefited and a raise in wages for Bill ensued.

This incident encouraged men to formulate changes for the better, and in the course of a year, certain products were manufactured at less cost. Of course, some men thought Bill was getting the breaks and were jealous, yet many of them started to think and their thinking was, in many cases, rewarded.

In a somewhat similar way, fraternities as well as plants issue publications to their membership. Especially is this true among fraternal insurance groups. Some of these plant publications devote space, not only to suggested improvements, but about employees who may be ill at their homes; also they print obituaries and now and then a witty gag is interspersed or an occasional short story. All of these items have a tendency to bring management and others closer together and will, many times, turn men into closer relations with their workmates.

The result of all this is that there are formed many lasting friendships and these bring on discussions among men in regard to their work and methods of procedure, all of which is good for everybody.

Ed's idea that a plant publication may become a harbinger of propaganda, shows him to be far, far behind the times.

Men need new inspiration to take them out of their ruts and this applies to all from the president down

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President
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to the poorest paid worker and a plant where such a periodical is published is doing a great service to its organization.

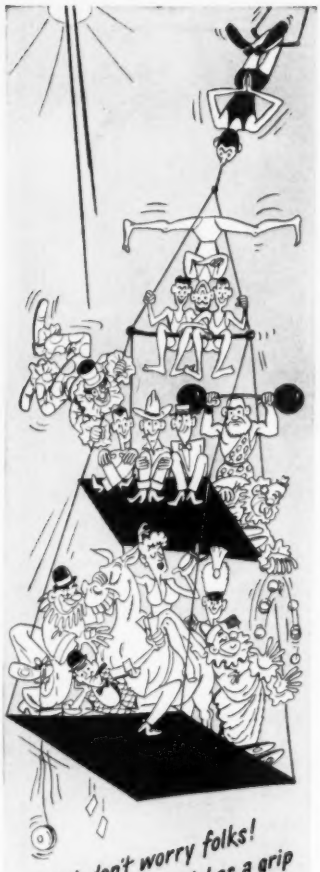
F. H. Stebbins
Worcester, N. Y.

•

IN THE answer to this question has lain the success or failure of more than one works magazine. Some editors try almost to compete with the daily newspaper or the periodical magazine. This is a mistaken idea; it is not the function they should seek to fill. Their true function is domestic, both from the social and technical points of view. The births, engagements, marriages of members of the families of the personnel and their educational achievements; the sources and production of the materials used in the firm's products together with their alternatives. Their workers may be acquainted with some of the component parts of the products made, but how many of them are known, the assembled whole and the importance in that assembly of the pieces they have helped to fashion? Why extreme accuracy or quality of finish is called for with some pieces and are not due to the idiosyncrasy of some examiner?

Articles on these and kindred subjects can be of inestimable value, engendering deeper interest in the firm's production. Where possible, such articles could be followed up by arranging that the workers could see the finished product under test. How many of them will have seen this; to some they have just made spindles; gear wheel blanks, etc., just pieces. The cost of showing the assembled whole in this way could easily be outweighted by the added interest and more intelligent work which could follow. Like the man who in mixing the mortar was helping to build a cathedral. They, in their work on components, would be helping to make an engine, machine, or ship. The firms, whose people feel the firm's products are partly their own—"ours"—will be able to count on a loyalty not to be lightly ignored.

So let the contents of works magazines be devoted to the well-being and interests of its own people and of all grades—the firm as a whole—whether that be just kindly gossip, domestic news, or the firm's products from each and every standpoint—cost, production, function, and reception in the world ouside their own select circle. Then, like the mortar-mixer mentioned, whose soul was bigger than his task, they



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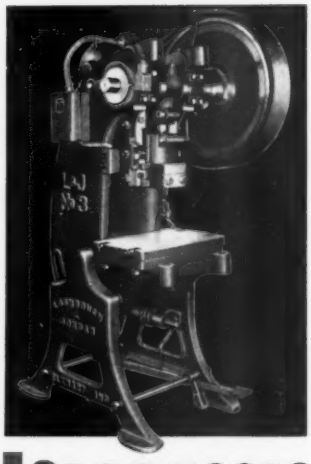

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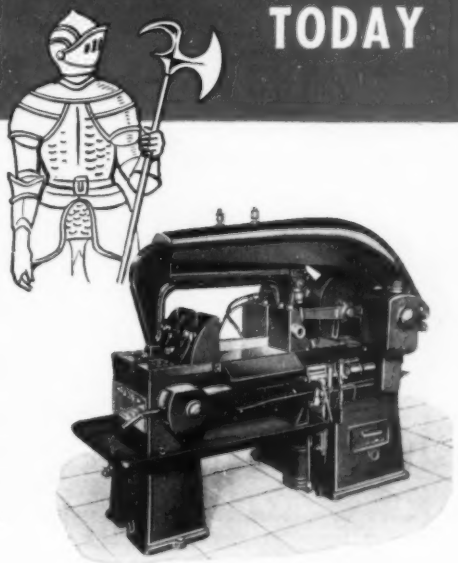

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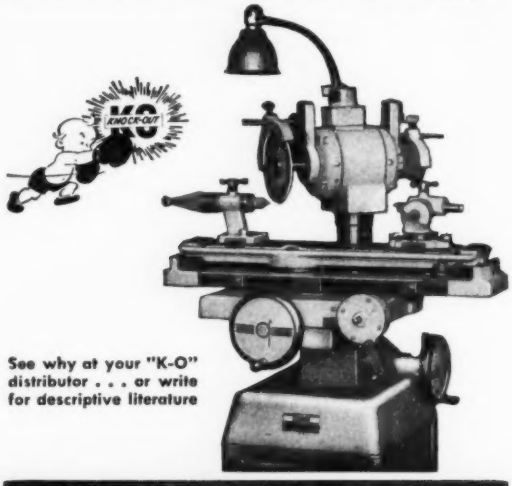

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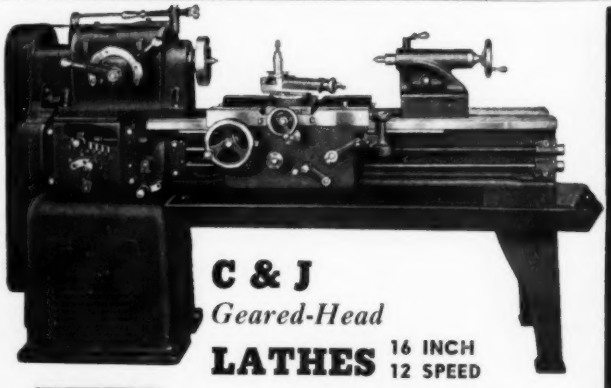

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may cease to make mere components and begin to visualize the whole with all that that implies.

The writer was once pitchforked into editing a works magazine. He found there had not been many articles likely to appeal to its readers as employees of the concern. One of their products was photographic lenses, but very few of their people knew anything about glass; its basic material or its production. An article was prepared going back to the early days of its discovery and the history of its development. The interest aroused was most encouraging and for this and similar articles, requests to copy were received from editors of other works magazines. The demand was there and good editorial work will foster this to the firm's benefit.

P. E. James
Lindum, England

•

SQUEAL OR SQUIRM

ANYONE who has experienced "group living"—from kindergarten through school and into the business and social world—has, in one way or another, been involved in a Squeal or Squirm deal. Since we must work and live in the presence of tale bearers, malicious or otherwise, we should learn to recognize the various types in order to deal intelligently with the problems which arise from time to time because of them.

When a man comes to his foreman with a complaint about a fellow-worker, he, as well as the foreman, is usually put on the spot insofar as the other men in the shop are concerned. The foreman's reaction can either help him or harm him in performing his duties as foreman. The foreman should be careful not to show any enthusiasm for the information brought to him. Such enthusiasm could only encourage malicious tale bearing or squealing.

In Al's immediate predicament he could send Moore back to his job. Shortly afterward he could send a messenger to both Moore and Riley asking them to step into the office, where in an impartial manner, Al could explain to both, exactly what is expected of each of them on their particular job. Get them to each acknowledge his individual understanding of these expectations. This should be done without any mentioning that "so and so" said "this or that." Moore will then have no occasion to "feel big" in Al's eyes nor "small" in Riley's eyes. Riley need never know that the matter

was really brought to Al's attention.

We all are familiar with the malicious type of squealer who, bearing a grudge against, or feeling jealousy toward, a fellow worker, is just waiting for an opportunity to "get something" on the other fellow. This individual is apt to take advantage of the boss' enthusiasm for tales brought to him. This squealer, when known for what he is, should be straightened out quickly, either having him state his complaint in the presence of his victim and the foreman or by having him put his complaint in writing above his signature. The malicious tale bearer or squealer will hesitate to do either and will think it over before running to the foreman with malicious squeals.

There is the type of squealer who wants to bolster his ego by attempting to "look big" in the eyes of his boss and who sees in every move of another man something to "talk up" in the presence of the boss. Look out for this one. The chances are he is trying to avoid close scrutiny of his own movements.

When a man has a legitimate squeal or gripe about lack of cooperation on the part of a fellow worker, he usually "blows off" right then and there, for everyone to hear. This fellow cannot be rightly classified as a squealer. Neither can the man who comes to his foreman in a formal manner and complains about his fellow worker.

If there is a lack of cooperation or team work between groups or individuals in the shop, the foreman should know about it—but, the foreman should be alert enough to sense it and when it exists there should be prompt action and no need for second hand information—get it first hand. Remember every tale bearer or squealer has a selfish motive—and the price of unasked-for information can run high.

Henry George
Dayton

•

NO FOREMAN should listen to squealing men. It is unworthy of any executive. If Riley is dogging on the job and Moore is squealing on him to Al, he can have no other things in mind than gaining favors with his foreman, and that kind of merit is of no use to the company. If I understand the situation right, Moore has no leading duty; therefore, it is none of his business to correct Riley.

If Riley was a member of a gang and Moore was the leading man in

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the gang his action would be justified, especially if they were working on some incentive system. If he was about to ruin the production it seems to me that Al would have noticed the situation and taken steps against him without Moore squealing.

If I had been in Al's place, I would have taken Moore right to Riley and told him to repeat his squealing. That would have given him a well-earned lesson. If Moore then had left or stayed Al would have gained more respect among his men than Moore was worth and the air would have been cleared. If Riley would have stayed after the incident I would have, after a day or so, called him into my office and spoken friendly to him to find out what was the matter. The whole situation would then perhaps show up in an entirely different light to what Moore was trying to impart.

I don't see why that should put Al into any squirm. If Riley did not give a satisfactory explanation, Al should point out to him the necessity of every man doing his duty. Al should shake hands with him and wish him good luck for the future.

If Riley, after that liberal chance, was still dogging on the job, Al might try to turn him over to some other department where he perhaps could get a more interesting job.

Calling together a committee of his best men would only make the situation more complicated.

A. E. Fristedt
Stockholm, Sweden

•

THE FOREMAN should and is expected to know what the workmen under his supervision are doing. However, it is possible and sometimes does occur that actions take place unobserved by the foreman, as no person is perfect.

In the case cited I think the one who gave the ill advice to the workman should be approached by the foreman and told of the trouble he had made and the harm that it had started in the organization, informing him that such things could not and woud not be tolerated, however if he could and would without publicity straighen matters out immediately the matter would be dropped this time but his future conduct must be reversed.

The foreman should not divulge to any one how he received the information, however he should express his thanks at the time with his assurance that his help would not be forgotten and that when the time came that he could do some-

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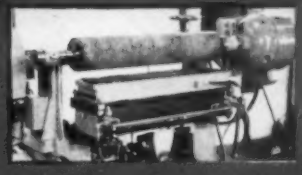
developed by Clair Manufacturing Co., Inc., of Olean, New York, for finishing back edges of knife blades, pocket knife spring backs, plier sections, large open-end wrenches and similar items.



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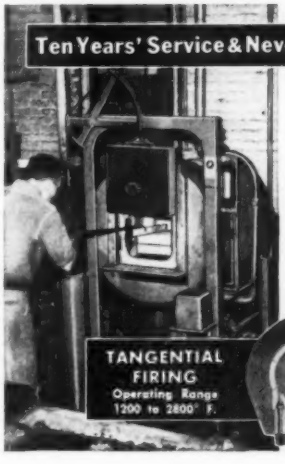

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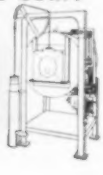

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Deep hole drilling machine in Conner Co. shop, at work on the worm gear illustrated above.

thing more substantial for him that he would be glad to do so.

If the starter of the trouble did not stop it promptly, we would advise that he be asked to submit his resignation and furnish a satisfactory reason for so doing in a way that would be the least disturbing.

Abel Blakeman
Watervliet, N. Y.

•

SORCERER'S APPRENTICE

THE ROUND TABLE regarding apprentices and the headaches they are alleged to create makes me wonder if they are being used as an alibi for a condition that is not their responsibility.

The class of work assigned to an apprentice should be within his ability at all times, and the judging of his ability should rest with the ones responsible for his training. When they assign work to him that he spoils because he is not sufficiently trained to do this work it reflects poor judgment on the part of the one who issued the job to the apprentice, therefore the apprentice should not be blamed.

All apprenticeship systems, whether large or small, can be so managed that the apprentice can be trained in a progressive manner, provided the parties responsible for having apprentices in their shop set up a system to suit their own individual requirements.

There is, of necessity, bound to be some difference in training procedure between one plant and another because of plant equipment and layout. Also, the kind of work done has a bearing on the training but, in all plants whether large or small, there are basic principles of training necessary to follow to produce a skilled craftsman.

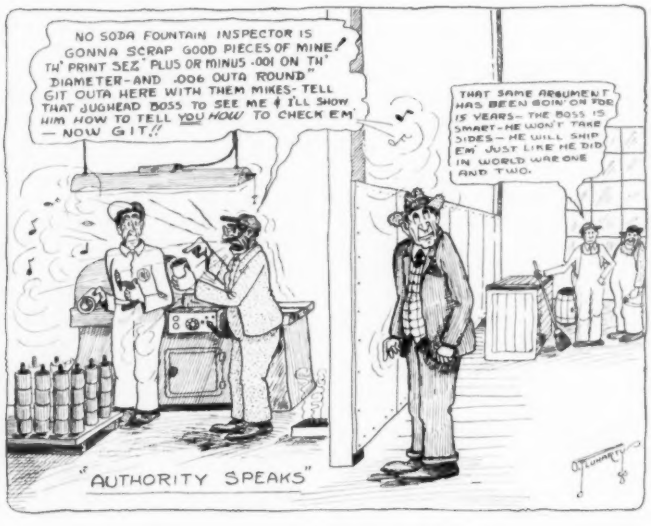
If Al will set up his program based on these principles, he will be proud of his apprentices instead of bemoaning the fact that such a being is allowed to exist.

James A. Gallagher
Esmond, R. I.

•

SOMEONE once said, "When I have a tough job in the plant and can't find an easy way to do it, I have a lazy man put on it. He'll find an easy way to do it in a short time. Then we adopt that method."

It is my experience that very often the so-called lazy man will provide more help and less yelp. To a certain extent we are all lazy. We all like to do a job in the method that is less tiring. We are constantly on the alert for new fully automatic operations that will produce more work with less effort on the worker's part. Many workers who do not produce on jobs that require their full effort turn out to be the best operators on automatic or semi-automatic machines. My boss once complained that every time he came around a certain worker was sitting down. When I showed the boss this man's production and quality record he decided it might be a good idea to supply stools for the workers. The so-called lazy worker will sometimes


NO SODA FOUNTAIN INSPECTOR IS GONNA SCRAP GOOD PIECES OF MINE! TH' PRINT SEZ ± PLUS OR MINUS .001 ON TH' DIAMETER-AND .006 OUTA ROUND" GIT OUTA HERE WITH THEM MIKES- TELL THAT JUGHEAD BOSS TO SEE ME & I'LL SHOW HIM HOW TO TELL YOU HOW TO CHECK EM — NOW GIT!!
THAT SAME ARGUMENT HAS BEEN GOIN' ON FOR 15 YEARS— THE BOSS IS SMART—HE WON'T TAKE SIDES— HE WILL SHIP EM' JUST LIKE HE DID IN WORLD WAR ONE AND TWO.
"AUTHORITY SPEAKS"

turn good suggestions and does often turn out to be a quick thinker. It may take the slow-moving operator longer to set up his machine but usually he will do a first class job and run longer than average.

We should all have the desire to do the job in the way that requires the least effort. In this way we conserve the energy of the worker and he in turn can produce more in the long run. In the final analysis, there is a difference between a lazy man and a loafer.

A. E. Salmons
Philadelphia, Pa.

•

LET'S SEE what makes a man lazy. One man is lazy, he does not want to work, because he has no ambition. Again, because he has enough to cover his wants. That man will work only when he has to obtain money to buy what he needs. Then he sees no need to work anymore. Some men are lazy because they are not satisfied with what they are doing. They take a job in a plant with the hope of being put to work on some of the jobs that they would like to work on. On being assigned to some job that they don't like, they work as little as they can get away with. If you stand over them they will try to do work. As soon as you move away they don't do anything, or as little as they can.

My dear Ed, do you like to do some of the jobs your wife gives you to do? You do not. Did you ever go to a friend's house to dinner where friend's wife prepared a meal that you particularly don't like? What do you do? You don't eat it as you would some dish that you like. You just pick on it, trying to make believe that you are eating. If you can get away with it, you will leave most of it not eaten, or you will try to prolong it as much as you can. That is the same with some men that are doing work assigned to them when they don't like that particular work. They will play around with it as long as they can if they can get away with it.

Now let's take another lazy man. A man who likes to do any job the easiest way, who tries to use his head instead of his hands, and you give that man a wheel barrow to push. He can't use his head to push it around, he must use his hands. So he does not push it. He keeps on thinking how to get away from pushing that barrow with his hands. In the meantime the wheelbarrow is not pushed around, and he is lazy because he does not do his job as John Jones does. He is transferred

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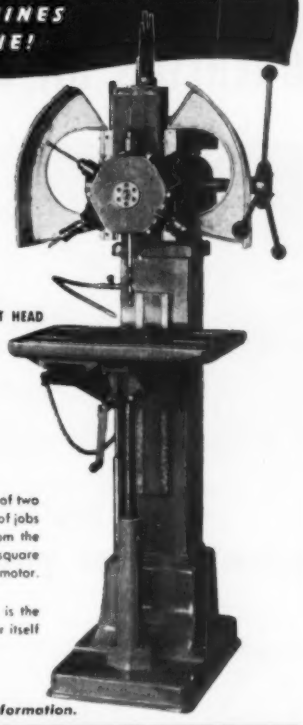

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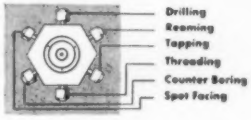

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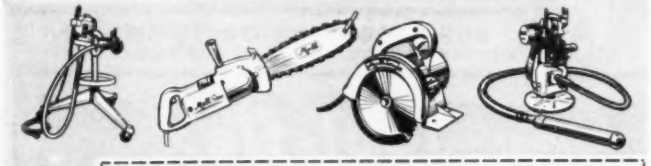

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to another job and that is to help to move machined parts from the machines to storehouse, and the same thing happens. He is not on the ball and does not produce as others in the shop, so therefore he is lazy.

It reminds me of the time when I used to work on the lathe in our shop. I had a 12-in. chuck and when I had to put it on the lathe I had to ask for a helper. I had to wait until the helper came. Some of the boys told me I was lazy because they do it themselves without a helper. I was annoyed that every time I had to change the chuck I had to wait for help. I could have picked up the chuck myself, but it was heavy, and I did not want to take chances of being ruptured. Finally I obtained a board wide enough and strong enough to place on the shelf against the wall, long enough to reach over the bed of the lathe. I nailed a stop on the back of the board so that when I placed it on the lathe it was against the inside of the bed of the lathe and it could not move away. I also nailed a stop so the chuck would stop and not roll off the board. After I made that board I did not have to ask anybody any favors to help me lift the chuck or to put it on the lathe. When I was through with the chuck I simply placed the board under the chuck on the lathe, the other end on the tool shelf against the wall. The board was ⅛ in. lower at the toolshelf end, so I rolled the chuck down the board to the toolshelf, leaving the chuck on the shelf. When I needed the chuck again I reversed the procedure. So you see by being lazy I did the easy job without any help.

Michael Axler
New York.

•

THERE ARE two sides to the story. There are men who work their heads off and get nowhere production-wise; there are men who seem to take it easy and yet get out a lot of work. If Madison was astute enough to foresee that Laziazell's antipathy for hard physical work would actually result in more work by a better method, he certainly deserves credit for putting him on the crank levers. But it does not follow that the same scheme will work with lazy men in general, with anything like regularity. It is entirely possible that Madison somehow knew that here was a job on which this particular man would like to work better than on others; a job that would challenge him mentally.

There is far more to a man liking

the job he has to do than is generally realized, with regard to effect on production. When a man definitely dislikes a job, he is bored all the while he is occupied with it, and boredom inevitably leads to fatigue. Knowledge of this fact causes many shrewd supervisors to make a certain amount of study of given men on given jobs, to see what alteration can be made, if any, that will cause a man to like his job better. It is altogether possible that there are factors in the crank-levers case known to Madison which are still unknown to both Ed and Al. Taking the trouble to watch the little gripes and the little enthusiasms, stemming from different workmen as reactions to their jobs, will often provide a foreman with many clews pointing to greater production possibilities.

Could it be that Madison, when he placed Laziazell on this job, made some off-hand mention of his belief that Laziazell could find a way to improve on methods used to date? Under a stimulus like that, many a man will work hard both physically and mentally to maintain the good reputation he already has in the eyes of his superior. And just here is a point. Real thinking is definitely hard work, whether we class it as such or not. Who will be the judge as to how hard a man is working, simply because he is not putting himself into a lather physically? It is nothing more than common sense to find the best possible way to do a thing, and then work only moderately hard physically to produce a really good day's work. If and when a man actually works himself to the point of exhaustion physically, he is certainly in no condition thenceforward to give his work the thought it should have. It is usually true that head beats hands. Exceptions are those relatively rare cases in which the hands are entirely too lazy to follow through.

Could every man in a huge plant be put through some kind of a laboratory machine which would analyze his thought processes, his idiosyncrasies and the reasons for them, his likes and his dislikes, his loyalties and his grudges, and leave the results on large cards for ready reference, many, many keys would be found opening doors through which each man could be led into far greater productiveness. There is no such machine, and there will be none such. But the supervisor who has the greatest ability to discover such factors for himself and to use them is the supervisor who will go farthest production-wise. If an Ed sees fit to stand on the sidelines and

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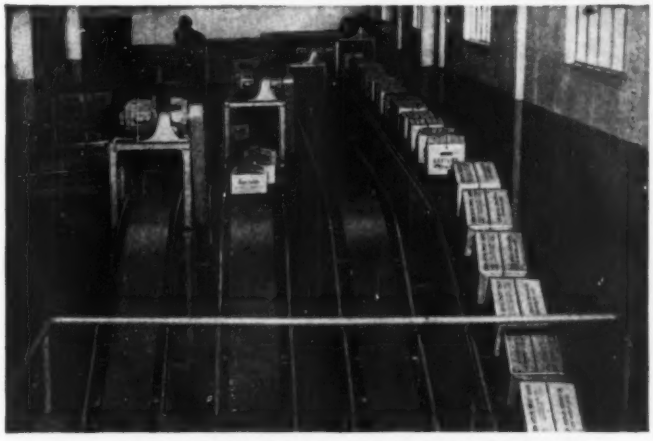

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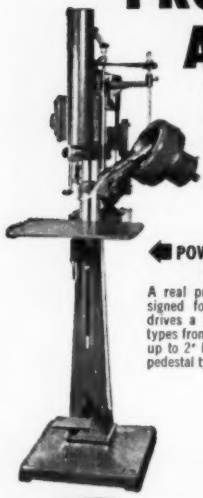

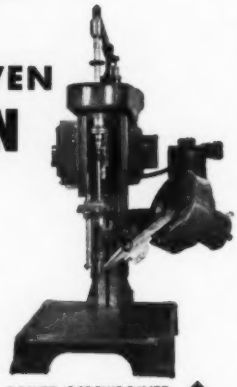

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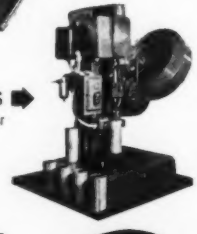

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scoff at the skill of a Madison in this respect, he will harm no man but himself and those who may be slow-witted enough to follow his faulty reasoning.

Nerve energy is consumed in genuine thinking and study, and it is consumed in physical labor. If one were to draw a line across a piece of paper, place a dot on each end of the line, calling one dot "study" and the other "physical labor," then a point mid-length of the line could be considered as representing a man spending half of his nerve force in study and half of it in physical labor. This is the strategic position for some men. In like manner, a point one-fourth the length of the line from the physical-labor dot would represent a man spending only one-fourth of his nerve in physical labor, and three-fourths of it in study. This would be the strategic position for some men. Though an infinite number of points are available on that line, there is no possible point on that line that would not truly represent the most strategic position for some man. That supervisor who is nearest correct in knowing just how to evaluate his men in this particular sense is tops. Hats off to Madison in this new one case, at least.

John E. Hyler
Peoria, Ill.

NEW BOOKS

INDUSTRIAL AND SAFETY PROBLEMS OF NUCLEAR TECHNOLOGY—*Edited by Morris H. Shamos, Asst Professor of Physics, and Sidney G. Roth, Asst Professor of Mathematics, New York University. Published by Harper & Brothers, 49 East 33rd St., New York 16, N. Y. 368 pages. Price $4.00.*

A symposium held by the Atomic Energy Commission and New York University was the source of this book. It contains chapters by 21 leaders in the fields of industrial development, nuclear research, radiation medicine, and casualty insurance.

Few applications have yet been found in Metalworking for radioisotopes and this is reflected in this symposium, which makes only fleeting reference to the subject. These are potentially important applications of radiography for the inspection of welds and castings and of isotopes for gages. Considerable de-

velopment along such lines can be expected.

Firms contemplating the use of radioisotopes will find the chapters on safety, waste disposal, and insurance problems of special interest.

•

THE SELECTION AND HARDENING OF TOOL STEELS — *By L. H. Seabright, Chemical and Metallurgical Engineer, Vulcan Stamping & Manufacturing Co. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y.*

A classification of tool steels, based on the "wear-toughness ratio" proposed originally by Harold B. Chambers, is presented in this book. The steels are broken into 12 groups, which in turn break down into 45 types.

There is a large list of representative steels by this code method followed by a discussion of heat treatments for each of the groups.

The code method is at variance with present trends in the standardization of tool steels. However, a good case can be made for this method of classification and there is much valuable reference data in the volume.

•

ACCREDITED UNDERGRADUATE ENGINEERING CURRICULA IN THE UNITED STATES-1950—*Engineers' Council for Professional Development, 29 W. 39th St., New York 18, N. Y. 42 pages. Price $.25.*

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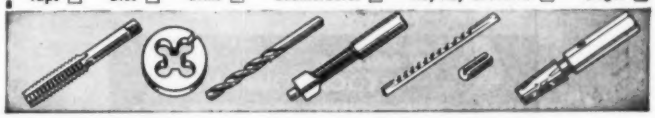

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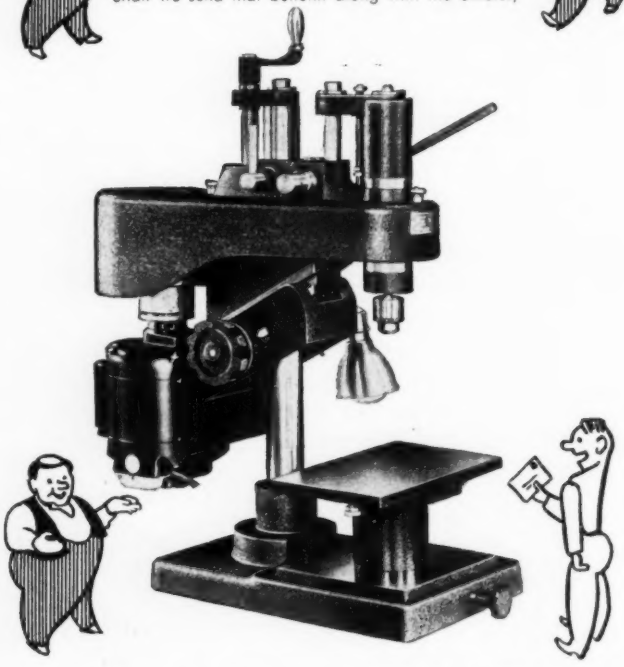

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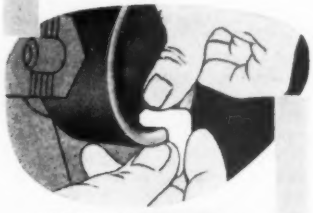

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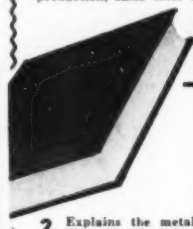

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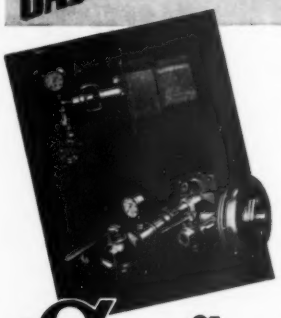

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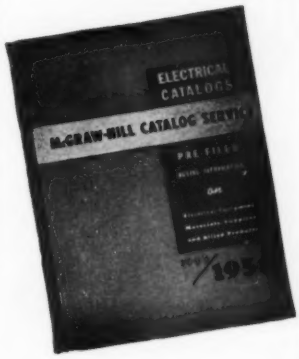

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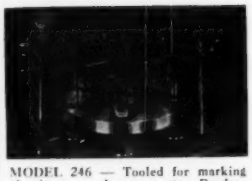

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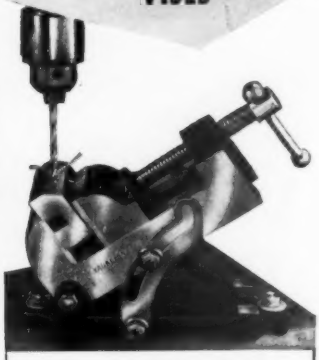

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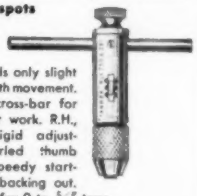

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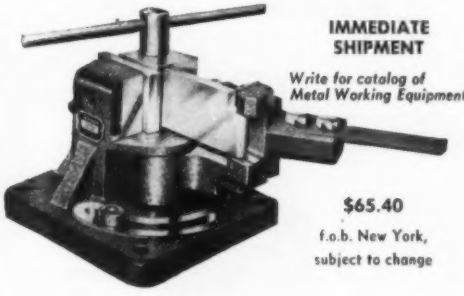

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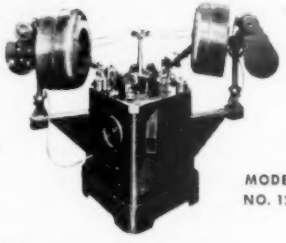

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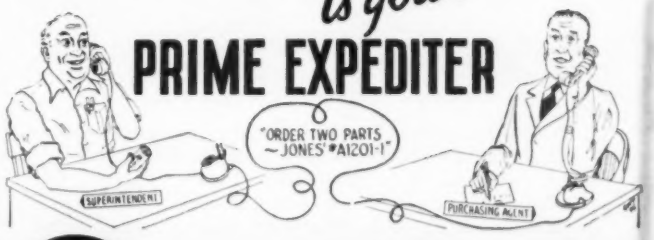

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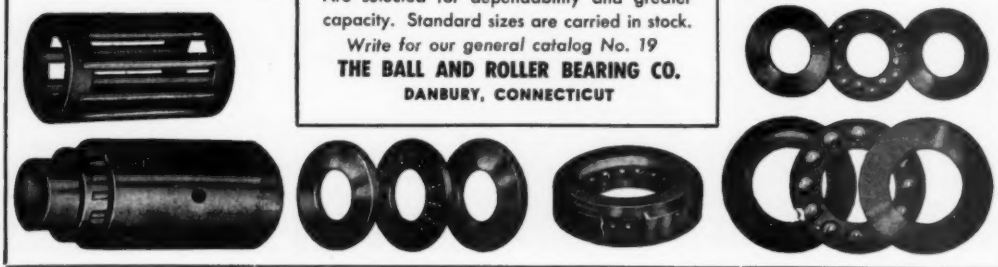

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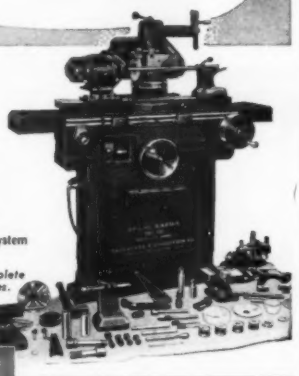

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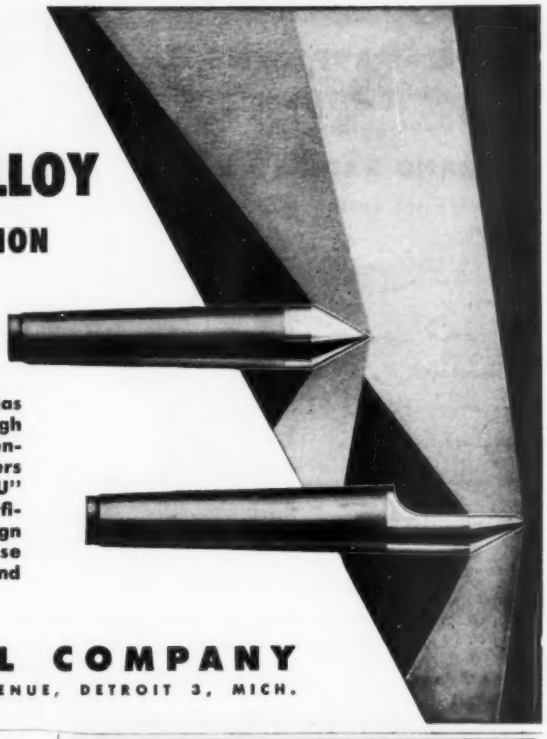

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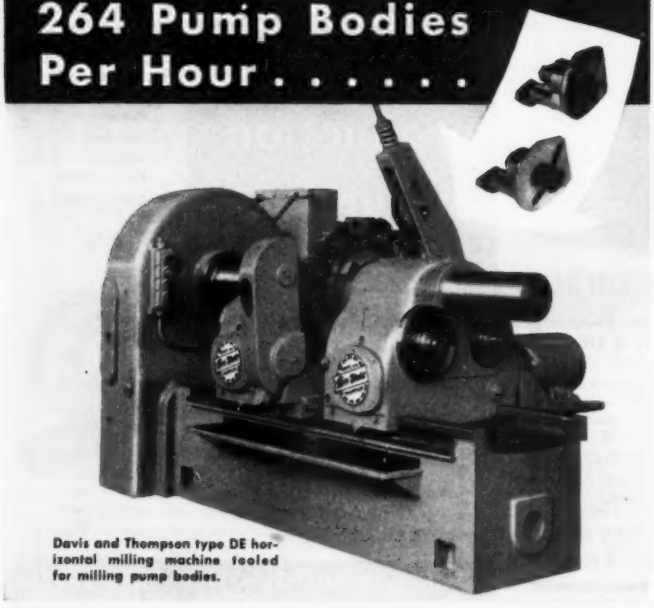

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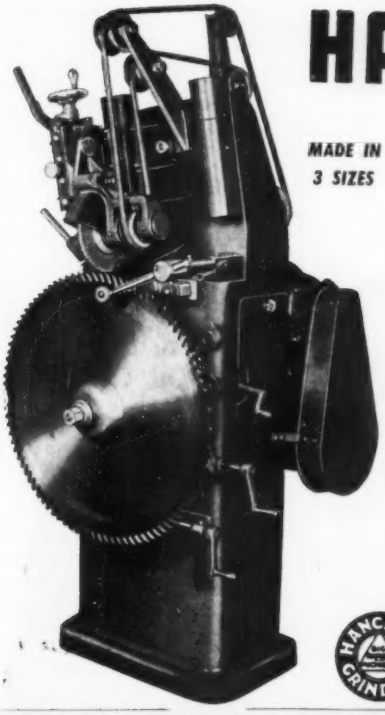

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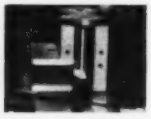

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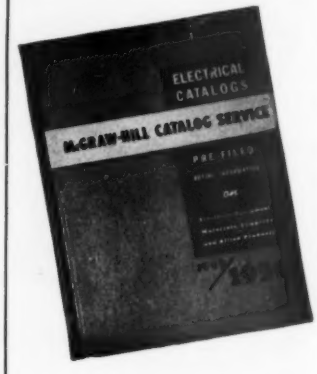

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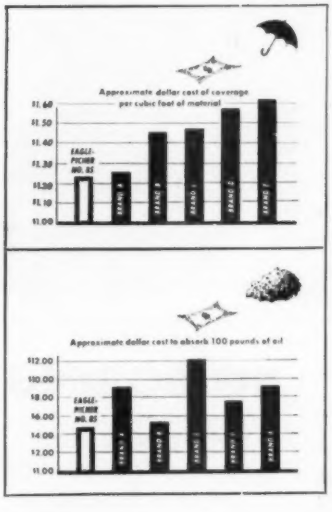

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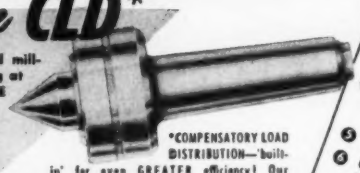

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at the extremely low first cost and the vitally important jobs that this little precision machine can do. It will pay you to get our accuracy information on this machine which has 6" x 10" table movement and 7" x 17½" table size.

Write TODAY For Full Information

LINLEY BROTHERS COMPANY

664 State St. Ext., Bridgeport 1, Conn.

STAMPINGS IN SMALL LOTS

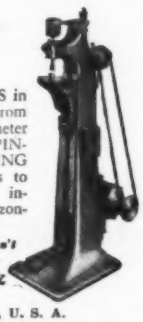
Precision Die Made—Lowest Possible Cost.

DAYTON ROGERS MFG. CO., Minneapolis 7, Minnesota

GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.

85 Silliman Ave., Bridgeport, Conn., U. S. A.

RANDALL and STICKNEY Dial Gauges and Indicators

are accurate, reliable and built to stand the gaff of hard usage.

This Model C Dial Indicator has a 2½ in. diameter dial, with 50 or 100 divisions. Can be furnished in graduations of .001-in., .0005-in. or .01 mm. Has a ½-in. range movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.

There is a R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

FRANK E. RANDALL CO., INC.
248 Ash St.
Waltham 54, Mass., U.S.A.
Makers of Dial Gauges Since 1885

H&G DIE HEADS

WITH INSERT CHASERS

FOR ALL MACHINES USED FOR CUTTING SCREW THREADS

The famous H & G Die Heads come in styles and sizes for all types of machines, including threading machines, chucking machines, drill presses, turret lathes, and automatic screw machines, such as Brown & Sharpe, Cleveland, Cone, Davenport, Economy, Foote-Burt, Greenlee, Gridley, Acme-Gridley, New Britain, New Britain-Gridley, Swiss, etc.

The small, inexpensive high-speed steel insert chasers are held by rugged carriers and cut threads straight and true to the close tolerances required.

The majority of expert production men prefer these die heads because of the ease with which insert chasers are resharpened and set, the low cost of insert chasers and the greater quantity of threads per grind and number of pieces threaded per chaser dollar.

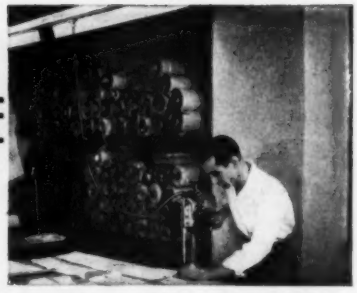
The reduction in inventory will pay for new die heads. For example: If you have $1,000 in chaser inventory, changing to H & G will require only $300, setting free $700 for the purchase of new H & G heads. This is due not only to low cost of chasers, but to interchangeability and long life.

Check and Mail for Free Copy ☐ "Selecting Proper Die Head for the Job"
☐ Style MM ☐ Style DMS ☐ Style DM ☐ Style TM

THE EASTERN MACHINE SCREW CORPORATION
20-40 BARCLAY STREET NEW HAVEN, CONN.

20-40 Mfrs. General Purpose Die Heads, Insert Chaser Die Heads, Threading Machines.

ELECTRIC FEEDRAIL



—*for* CUTTING AND SEWING

For efficient cutting you move the tool—not the work. Too many times a loose wire trails along behind the tool and hinders the operator. With Electric Feedrail, the enclosed busway distribution system, the wire comes down from a trolley overhead. Each tool may be fused or protected by a circuit breaker. Tools may be moved to another bench in a jiffy or the whole system can be removed to another building with the use of only a wrench and a screw driver. A battery of sewing machines may be relocated in a half hour for changes in production requirements. Write for Bulletin. 40-0

"A FEEDRAIL INSTALLATION NEVER BECOMES OBSOLETE"

ELECTRIC FEEDRAIL

FEEDRAIL CORPORATION
Subsidiary of Russell & Stoll Company, Inc.
125 BARCLAY STREET • NEW YORK 7, N. Y.

Tell us your needs NOW... An early order from you will avoid the rush!

the ADAMS line

Spur Gears	Ratchets
Helical Gears	Splined Shafts
Bevel and Miter Gears	Racks
Worms and Worm Gears	Lead and Feed Screws
Sprockets	Shaved Tooth Gears
Internal Gears (Spur and Helical)	(Spur and Helical)
	Ground Thread Worms

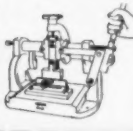
Made to your specifications . . . exactly!

The ADAMS Compa
Dubuque, Iowa, U. S. A.
ESTABLISHED 1883
FINE GEARS MADE TO YOUR SPECIFICATIONS

GEARS

MARK ROUNDS or FLATS

WITH THE MODEL 9A MARKING MACHINE, COMES IN HAND, MOTOR AND AIR DRIVEN MODELS.



If you make precision parts you need the 9A machine.

ACROMARK Company

7-13 MORRELL ST., ELIZABETH 4, N. J.

Reprinted again by request:

DISASTER CONTROL

Send for your copies: 50¢ each

Reader Service Dept. American Machinist

From the *American Machinist* Library of *Tips for Top Shop Men*

As a man moves up, he must show more initiative, more self-control, more ability to handle responsibility. He must be able to decide between intangibles of alternative solutions, timings, goals—and bat at least .500.

Die-Making Machines

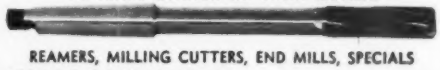
They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

OLIVER OF ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

ATTENTION REAMER BUYERS

70 YEARS CHOICE OF TOOL EXPERTS



REAMERS, MILLING CUTTERS, END MILLS, SPECIALS

ALVORD-POLK TOOL CO. Millersburg, Pa.

H&W

HENRY & WRIGHT

DIVISION OF HARTFORD-EMPIRE COMPANY

HARTFORD 5, CONNECTICUT

DIEING MACHINES

(HIGH SPEED AUTOMATIC PRESSES)

HIGHEST SPEEDS — LONGEST DIE LIFE

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE

(Not available for equipment advertising)

$1.20 per line, minimum 4 lines. To figure advance payment count 5 average words as a line.

INDIVIDUAL EMPLOYMENT WANTED undisplayed advertising rate is one-half of rate, payable in advance.

PROPOSALS, $1.20 a line an insertion.

INFORMATION

BOX NUMBERS count 1 line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

EQUIPMENT WANTED or **FOR SALE ADVERTISEMENTS** acceptable only in Displayed Style.

DISPLAYED RATE

The advertising rate is $10.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches to a page. A.M.

NEW ADVERTISING received by 10 A.M. February 6th will appear in the issue of February 19th subject to limitation of space available

WANTED

FOUR SLIDES OR MULTI-SLIDES—Nilson, U. S. Tool, Baird, Manville.

GANG SLITTERS—Waterbury, Paxton, Yoder, Torrington, Bliss.

EYELET OR TRANSFER PRESSES—Waterbury-Farrel, Baird or Bliss.

WIRE DRAWING MACHINES — Vaughn, Waterbury, Morgan-Connor or Syncro.

ROLLING MILLS—Bliss, Waterbury, Standard, Torrington, etc.

ALWAYS IN THE MARKET TO BUY THIS TYPE OF EQUIPMENT

W 8697 AMERICAN MACHINIST
330 W. 42nd St. New York 18, N. Y.

WANTED

2—24", 3 jaw air chucks for Gisholt Simplimatic lathes.

1—24", 3 jaw combination chuck for new Gisholt 3L lathe.

GUNITE FOUNDRIES CORP.
ROCKFORD, ILLINOIS

WANTED

RADIAL DRILL TABLE

Approx. 32" long x 26" wide x 20" high. 4 T slots on top. 3 T slots in front.

Send details and price

RALPH STARK, INC.
43-12 33rd St., Long Island City 1, N. Y.

RIVET HEADER WANTED

One single stroke solid die rivet header with capacity to cold head aluminum rivets up to 1" dia. x 4½" long including preferably feeding and straightening mechanism. Reply to Purchasing Department, **ALUMINUM COMPANY OF CANADA, LTD.**, 1700 Sun Life Building, Montreal, Quebec.

WANTED — LATHE

TYPE 18" to 22" SWING LATHE

WYTHE ENGINEERING COMPANY
600 Wythe Ave., Brooklyn 11, N. Y.
Telephone: EVergreen 8-0362

WANTED

- ETNA #5HCO Tube Cut-off Mach.
- NATCO 8-10 sp. adj. 6-24", 10-15 HP
- 6-Sp. AUTO. Sc. Mach. ⅞" or 1" cap.

Dealers

PELHAM MACHINERY & SUPPLY CO.
125 Fifth Avenue • Pelham 65, N. Y.

WANTED

HENRY & WRIGHT DIEING PRESSES
10 to 100 Ton Cap.
Also Steel Sheets, Strip Steel Coils
Please send lists
W-7377, AMERICAN MACHINIST
330 W. 42 St., New York 18, N. Y.

REPLIES (Box No.):
Address to office nearest you
NEW YORK: 330 W. 42 St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

WANTED — ASSISTANT Superintendent — Job Shop manufacturer of heavy precision machinery needs experienced man to help handle machine shop. Must be thoroughly familiar with large machine tools and their operations. Preferred age 35 to 45. Permanent. Applicant must have promotional possibilities. Plant of 350 employees located in Fox River Valley Section of North Central Wisconsin. Complete details of past experience and salary expected in first letter. P-8741, American Machinist.

WANTED: TOOL ROOM Foreman — to take charge of small tool room in company which employs 250 production workers. Eight employees in tool room. Modern equipment. Nice working conditions. Dies are small as maximum press in production is 95 ton capacity. Company has been in business for 30 years and is very successful. Good opportunity. State experience and salary expected. P-8702, American Machinist.

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 41 years). Procedure of highest ethical standards in individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 266 Dun Bldg., Buffalo 2, N. Y.

POSITION WANTED

MANAGER—SUPERINTENDENT, capable of handling heavy responsibility. Varied and successful manufacturing experience. Mechanical Engineering 15 years. Industrial Engineering background. Featuring Engines, Turbines, Tools and Dies. PW-8807, American Machinist.

PATENT ATTORNEY

Patent Practice

before U.S. Patent Office. Validity and infringement investigations and opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine and Rommel, Registered Patent Attorneys. Suite 483, 815 15th Street, N. W., Washington 5, D. C.

HAVE YOU SUITABLE POSITION, AGENCY OR PARTNERSHIP?

Machine-Tools, Tools, machinery, etc. Sales, Consulting Engineering; executive duties; lived, traveled extensively here and abroad; designed, invented, patented, manufactured; born, educated in Germany; U. S. citizen over 20 years; Christian; free to go anywhere; financially independent. Speak Spanish, French also.

PW 8791 AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

LEADING MACHINE TOOL MANUFACTURER MIDWEST

Has outstanding opportunity for machine tool design engineer as project design leader. Excellent advancement opportunities. Best working conditions.

Confidential handling by prominent management engineering firm. Reply to

P8662, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

PRECISION MACHINISTS TOOL AND DIE MAKERS

Work For
HUGHES

Security in long range program
Newest equipment in modern laboratories and shops
Opportunity to work with nationally outstanding scientists and engineers

Mail request for application to:

HUGHES RESEARCH AND DEVELOPMENT LABORATORIES
Culver City, Calif.

SENIOR ENGINEER WANTED

By consulting engineering firm located in New York City. Must be graduate of recognized engineering college with manufacturing experiences in metal working industry as Plant Manager or Assistant Plant Manager. Age 35-45. Give age, education, experience, references and salary required. All replies kept confidential.

P-8192, AMERICAN MACHINIST
330 W. 42 St., New York 18, N. Y.

J. L. OVERHOLT
WABASH EMPLOYMENT AGENCY
202 South State Street
Chicago 4, Illinois WABASH—5029

Specializes in placing all types of draftsmen, designers, engineers, technical men and executives.

Write for full information today.

PATTERNS in WOOD and METAL

For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us—we will take care of them
GENERAL PATTERN WORKS
2233 Bank Street Cincinnati, Ohio

PUBLIC AUCTION

WEDNESDAY AND THURSDAY
STARTING AT 11:00 A.M. EACH DAY

FEBRUARY 14-15, 1951

An All Out Absolute Liquidation of

METAL STAMPING, SHEET METAL & TOOL ROOM MACHINERY & EQUIPMENT

ON THE PREMISES OF THE

DURASTEEL Company, HANNIBAL, MISSOURI

24 PUNCH PRESSES

3—Verson 200 Ton Nos. 40-ES, 40-FS, 40-HS; 2—Verson 70 Ton Nos. 40-LS, 40-MS; Cleveland 150 Ton No. 60D-84; 3—Marshalltown 70 Ton No. 6A and 2—50 Ton No. 5; 4—Federals 79 Ton No. 7, 49 Ton No. 5, 37 Ton No. 4 and 26 Ton No. 3; 5—Bliss 45 Ton No. 21A and 29 Ton No. 40; 4—Robinsons 25 Ton No. 1½, 5½ Ton No. 0 and 14 Ton No. 16; Famco 7½ Ton No. 51.

5 POWER SQUARING SHEARS

Niagara 10' x 10 Ga.; Pexto 8' x 10 Ga.; 2—Pexto 6' x 16 Ga.; and Niagara 3' x 16 Ga.

AUTOMOTIVE EQUIPMENT

Chevrolet Station Wagon, Reo "Speed Wagon" Tractor and 2 Fruehauf Dual Wheel Trailers.

MACHINE TOOLS & TOOL ROOM EQP'T.

Index Vertical Mill; Dow No. 1 Mill; G & E 24" Shaper; Reed-Prentice 14"x 30" G.H. Lathe; South Bend 15"x6' and L & S 24"x12' G.C.G. Engine Lathes; Hardinge Precision Toolmakers Lathe; Norton and Thompson Hydraulic Surface Grinders; Model V-16 DoAll Saw; Marvel and Wells Metal Cutting Saws; Rockwell Hardness Tester and Precision Tools; 15 Drill Presses.

WELDERS & SHEET METAL EQP'T.

Taylor-Winfield 200 KVA Seam Welder; 4 Progressive 50 to 75 KVA Gun Welders; 10 Rex and Taylor-Winfield 20 to 50 KVA Spot Welders; 13 Hobart, G.E., Westinghouse and Lincoln 200 to 400 Amp Arc Welders; Roll Benders; Tube Benders; Riveters; Grinding, Polishing and Sanding Equipment; Paint Spraying & Degreasing Equipment.

AIR COMPRESSORS — FACTORY EQP'T.

Chicago Pneumatic, Size 13½—8 x 8, Class O, Simplate Valve and Gardner-Denver Air Compressors; Towmotor 5 Ton and 2 Ton Fork Lifts; Portelevator Die Trucks; Electric Hoists and Roller Conveyor; Hydraulic Lift Trucks; Motors, Pumps & Fans.

2 PRESS BRAKES

Verson 60 Ton No. 204 All Steel and Dreis & Krump 5' x 16 Ga. No. 254.

HIGH GRADE OFFICE EQP'T.

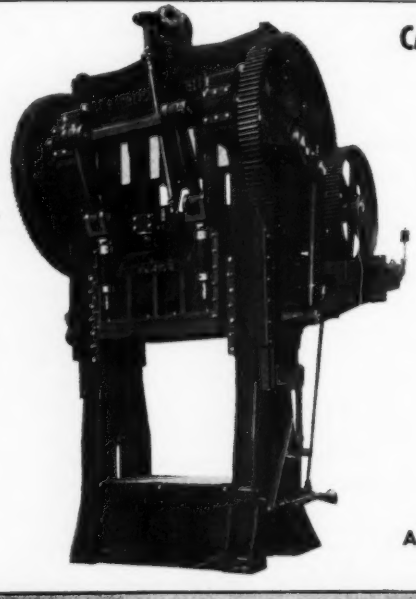
5 Friden Electric Calculators; Burroughs Electric Bookkeeping Machine; 4 Dictaphones; 2 Transcribers & Shaver; 10 Typewriters; Electric Time Clock; 3 Electric Adding Machines; Mimeograph, Mimeoscope and Puntomatic Machines; Drafting Room Equipment; Desks, Chairs, Filing Cabinets and Safe Cabinets; Office Air Conditioner and Water Coolers, Etc.

Descriptive Circular Mailed on Request — WRITE — WIRE — PHONE

Samuel L. WINTERNITZ & CO.

Auctioneers • Liquidators • Appraisers

1ST NATIONAL BANK BLDG., CHICAGO 3, ILLINOIS



CAN *YOU* USE THESE PRESSES for IMMEDIATE SHIPMENT?

2—BLISS No. 410A Double Crank Toggle Drawing Presses
Tie rod construction
Double back geared
Ratio—50:1
Approx. rated tonnage drawing stroke—350 tons
All steel gearing
Twin Drive
Hand actuated double grip friction clutch
Area top of bed—60" F to B x 84" R to L
Stroke of drawing slide—25"
Stroke of blankholder slide—8"
Motor drive
Approx. Net Weight—225,000#

Note—1 machine equipped with CUSHIONS

Write, Wire or Phone for details!

AMERICA'S LARGEST STOCK—
SEND FOR LATEST CATALOG

MOREY MACHINERY CO., INC.

406 BROOME ST., NEW YORK 13, N. Y.
TELEPHONE: CANAL 6-5360
CABLE ADDRESS: WOODWORK, N. Y.

BUY FROM STOCK
Telephone
BAKER 5887

FALK
MACHINERY COMPANY

10 WARD ST.
ROCHESTER 5
N. Y.

Every Item Guaranteed as Represented.

AUTOMATIC, #0 B & S Auto. Cut-Off 11/16" Cap.
AUTOMATIC, 1¼" Four Spdle. Cone. w/Thrd. Spdle.
AUTOMATIC, Nat-Acme #C, 5-Spdle. 9/16".
AUTOMATIC, B & S #2 Wire Feed. 1".
AUTOMATIC B & S #2G, 1".
BORING MILL, Niles B & P 120" Vert. 30 h.p.
BORING MILL, Colburn 60" Vert. Two Hds.
BORING MILL, Bullard 24" Vert. New Era Type.
BORING MILL, Gisholt 42" Vert. 220/440 volts.
BORING MILL, Lucas #31 Horiz. 5" Bar.
BORING MILL, Giddings & L #0 Horiz. 3" Bar.
BORING MILL, Giddings & L #32 Horiz. 3½" Bar.
BORING MILL, Ryerson #11 Horz. 3" Cap. #6 M.T.
BORING MILL, Barrett #2 Horiz. Cyl. Borer. 5"
BORING MILL, Betts 78" Vert. Turning & Boring.
New in 1943. All Electricals.
BORING MILL, 61" Bullard MAXI-MILL. 2 Hds.
BORING MILL, #0 Giddings & Lewis, 3½" Bar. #5 M.T. 220/440 volts. TWO.
THREAD MILLER, Pratt & Whitney #1105, 6x14 cap. 220/440 volts.
THREAD MILLER, Hanson Whitney 4"x9" Univ. Semi-Automatic.
THREAD MILLER, Hanson Whitney 7½x11 Univ. Semi-Automatic.
THREAD MILLER, Lees Bradner #20 Automatic Chucking. 220/440 v.
VERT. MILL, Linley High Speed Jig Borer & Miller. 8-speeds, 275 to 4250 r.p.m. w/indicators & measuring rods.
HONE, Barnes #307 Sole. Spdle. Hydraulically Reciprocated Twin Cylinder Vertical Honing Machine. 220/440 motors.
DISC GRINDER, Besley #265—18" Dble. End Motor Driven. 220/440 volts. Wet or Dry.
HAMMER, Rivetting, High Speed, All Sizes, motor driven.
HAMMER, Bradley 200# Rubber Cushioned Helve. 225 to 240 blows per minute. Single pulley drive.
LATHES, TURRET, Bardons & Oliver #1 Electric Bar Feed. ⅝" cap. Collets, Rd. Sq. Hx. 220 volts motor.
BORING MILL, Bullard 54" Vert. Spiral Drive.
Sommer & Adams #20A Boring, Hobbing & Threading Machine. Timken Bearings. Swings 36" over bed. 18" cross feed, 42" longit. Carriage has rapid approach & return. Used to mill internal threads. Excellent Condition.
GOREMATIC, Heald #49 Sole. End. W/Univ. Fixture. 220/440 volts.
BROACH, Ollesar 10 Tons Horiz. 56" Str.
BUFFER & POLISHER, U. S. Electrical Multi-Speed Double End #95, 5 h.p., 220 volts.
SGLE. SPDLE. DRILL, Foodick 16" Sldg. Hd. #2
SGLE. SPDLE. DRILL, Barnes 24". #4 M.T.
SGLE. SPDLE. DRILL, Barnes 20". #3 M.T.
SGLE. SPDLE. DRILL, Buffalo #2MS. 26" #3 M.T.
SGLE. SPDLE. DRILL, Aurora 36" Brdg. #3 M.T.
SGLE. SPDLE. DRILL, Colburn #2 Mfg. #4 M.T.
TWO SPDL. DRILL, Leland Gifford 20". #2 M.T.
TWO SPDLE. DRILL, Leland Gifford 26". #2 M.T.
TWO SPDLE. DRILL, Leland Gifford #2LMS 20". #2 M.T. 11" o.o.
DRILL, Avey-Matic #3 Hvy. 2-Spdl. #3 M.T. 24".
3—SPDLE. DRILL, Leland Gifford #2 MS—14". 11"
3—SPDLE. DRILL, Edlund #2B, #2 M.T. 16". 9½"
DRILL, L. Giffords #2MS 14". 11" C.C. 3-Spdle
4—SPDLE. DRILL, Leland Gifford 20". #2 M.T. 11"
4—SPDLE. DRILL, Demco #KT. #2 M.T. 24"
6—SPDLE. DRILL, Leland Gifford 14". #2 M.T.
DRILL, Cincinnati 21" Brdg. Drilling & Tapping.
DRILL, Radial, Cinci-Bick. 5' Arm, 13" Col. #5 M.T. 24 speed gearbox. 7½ h.p. 3/60/220.
DRILL, Baker #314 Hvy. Pattern High Speed Vertical Boring & Drilling Machine, 7½ h.p. 220/440 motor, #5 taper, 12 feeds, 6 speeds, 12¼" throat, 3" Capacity in steel.

PARTIAL LISTING OF LARGEST STOCK IN THIS AREA

RADIAL DRILL, Foodick 5' Arm, 14" Col. #5 M.T.
RADIAL DRILL, Mueller 3½' Arm, 11" Col. #4 M.T. 220/440 Volts.
RADIAL DRILL, Cinci-Bickford 4' Arm, 13" Col. #5 M.T. 220/440 volts.
RADIAL DRILL, Cinci-Bickford 6' Arm. 15" Col. #5 M.T. 220/440 volts.
RADIAL DRILL, Carlton 4'-15". Motor Dr.
DRILL, Natco #12 Multiple Spindle Motor Driven. #1 taper, 3 h.p. 220/440 motor. Arranged for 18 spindles. Rectangular head. With Natco 24" Rotary Table.
BASE PITCH & SPACE MEASURING MACHINE. #337 Illinois. Late Type—Like New. Capacity—12" diameter gear, 15" between centers. Full Set of Off-Set and Straight Contact Fingers, Dial Indicator, Tailstocks and Leatherette Cover.
SURFACE GRINDER, Horiz. #15 Covel 19½"x17½".
SURFACE GRINDER, Horiz. Leach 6"x12" Hand.
SURFACE GRINDER, Horiz. Thompson 18"x9" Hydraulic. 1942.
GRINDER, Cylindrical, Brown & Sharpe #2 Universal. 220/440 motors.
GRINDER, Tool & Cutter, Sterling #F Universal. 220/440 motors.
GRINDER, Surface, Covel #78 Horiz. Hydraulic 8"x24".
GRINDER, Cam, Landis 5"x60" "Type D" Hydraulic Semi-Automatic. New in 1942. Slight use, like new.
GRINDER, Cylindrical, Norton 10"x24" Hydraulic.
GRINDER, Cylindrical, B & Sharpe #4 Univ.
GRINDER, Cylindrical, B & Sharpe #18. 6x18.
GRINDER, Cylindrical, Cinci. 6x18 Hydraulic.
THREAD GRINDER, J & Lamson #TG-615 Automatic. Late Type
GRINDER, Blanchard #16, 26" Chuck Vert Rotary.
GRINDER, Landis Crank 10x32 Hydraulic.
GRINDER, Brown & Sharpe #2 Auto. Horiz. Surface.
GRINDER, Cincinnati #EA, 10" x 36" Hydraulic Cylindrical. Filmatic Bearings. 220 volts motors. Built-in electrics. Hydraulic Infeed.
GRINDER, Norton 6 x 18 Hydraulic Vert. Rotary Auto. Excello Spdle.
GRINDER, Norton 6 x 18 Hydraulic Horiz. Surface. Excello Spdl.
GRINDER, Pratt Whitney 22" Vert. Rotary. 84" table travel.
GRINDER, Greenfield #12 Internal Hydromatic. 220/440 V.
GRINDER, Heald #70 Internal.
GRINDER, Pratt Whitney 14x36 Vert. Rotary.
GEAR HOBBER, B & S #34 Spur. 18" dia.
GEAR SHAPER, Fellows #7 High Speed.
KEYSEATER, Mitts & Merrill #3 Giant Motor Driven, 220/440 volts motor. Capacity—24" long, 3" wide keyway. Automatic Feed.
LATHE, 32"x18' Bridgeford Q.C.G. Grd. Hd.
LATHE, American 27"x16' Grd. Hd. 12 Speed. Taper attach. & chuck.
LATHE, 26"x18' Bridgeford Q.C.G. Grd. Hd.
LATHE, Bridgeford 26"x14' Q.C.G. 8'5" C.C. 220 volts two speed motor.
LATHE, 24"x8' Lodge Shipley, Hvy. Duty.
LATHE, 24"x14' LeBlond Q.C.G. Grd. Hd.
LATHE, 20"x10' American Q.C.G. 72" c.c.
LATHE, 20"x10' Hendey Q.C.G. Taper Att.
LATHE, Reed-Prentice 20"x60' Grd. Hd.
LATHE, 20"x8' Lodge & Shipley Q.C.G.
LATHE, 18"x8' Lodge Shipley Q.C.G. Gr. Hd.
LATHE, 16"x6' LeBlond Q.C.G. Taper Attach.
LATHE, 16"x6' Lodge Shipley Q.C.G. Grd. Hd.
LATHE, 14"x8' Hendey Q.C.G. Taper Attach.
LATHE, 14"x6' Hendey Q.C.G. Taper Attach.
LATHE, 12"x5' Hendey Q.C.G. Taper Attach.
LATHE, 10"x24" Logan #820 Q.C.G. NEW
LATHES, Turret #4 W & S Univ. 1½".
LATHES, Turret, #2 Simmons Grd. Hd. 1".
MILLING MACHINE, Vert. #3 Cinci. High Power.
MILLING Machines, Vert. #4 Cinci. High Power.
MILLING Machine, Horiz. #2, #3, #4, #5 High Power. 220/440 Motors.
MILLING Machine, Horiz. #3 Kempsmith Univer.
MILLING Machine, Horiz. #4 LeBlond Univ. Hvy.
MILLING Machine, Horiz. #1½ B & Sharpe Univ.
MILLING Machine, Horiz. #2 Kempsmith Univ.
MILLING Machine, Horiz. #2 B & Sharpe Univ.
MILLING Machine, Horiz. #3 B & Sharpe Univ.
MILLING Machine, Duplex, Cochrane-Bly #14 Univ.
Mill & Shaper, #9 Taper. Shaper—0" to 6" Stroke. Rotary Table. 220-440 volts.
MILLING Machine, Duplex, Van Norman #2.
MILLING Machine, Cincin. #4—36 Plain Hydmatic.
MILLING Machine, Prod. #1—18 Cinci. Hor. Auto.
MILLING Machine, Prod. #0—8 Cinci. Vertical.
MILLING Machine, Prod. #0—8 Cinci. Auto. Horiz.
MILLING Machine, Production, #12 B&S 18" Late Type (6).
MILLING Machine, Prod. #12 B&S 24" Late Type.
MILLING Machine, Horiz. K&T #2B Dble. Overarm. 220/440.
MILLING Machine, Horiz. K&T #3B Dble. Overarm. 220/440.
MILLING Machine, Horiz. Atlas Bench Mill, Like new.
MILLING Machine, Horiz. Nichols Hand Millers. Late type.
MILLING MACHINE, Cincinnati Vertical #3 H.S. Dial Type. W/Rotary Table.
MILLING MACHINE, U. S. #MMI-8 Cam Controlled Automatic Horizontal, #40 taper, Late Type, 220/440 motors. TWO.
THREAD MILLER, Pias-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine. #40 Spdl. Timken Bearing. THY-MO-TROL Control Unit. 5 h.p.
PIPE THREADER, Williams #3. 1½" to 6".
BOLT THREADER, Hill-Acme #1½-C Sole. Hd.
TAPPER & THREADER, W & S #11R Dual Radial. Motor and Tooling.
TAPPER, W & S #1 Sgle. Spdle.
O.B.I. Press, Bliss #21B, 40 tons. 2½" Stroke.
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POWER PRESS, Bliss #75½ S.S.S.A. 128 tons, 5½" Stroke, 24" between uprights.
POWER PRESS, Bliss #3A S.S. Dble. Crank S.A. Grd. 45 tons, 4" stroke, 36" between uprights.
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PRESS, Federal #2 O.B.I. 2" Stro.
PRESS, Federal #3 O.B.I. Grd. 4" Stro.
PRESS, Federal #4 O.B.I. Grd. 3" Stro.
GEAR SHAPER, Fellows #72 High Speed.
SHAPER, Vert., Pratt Whitney #B—6" Motor Dr.
SHAPER—Columbia 32" D.G. Crank.
SHEAR, Gap Squaring Niagara #9126B. 10'x¾". Overdriven. 18" Gap. 20 h.p. motor, 220 V. spring hold-down and extra blades.
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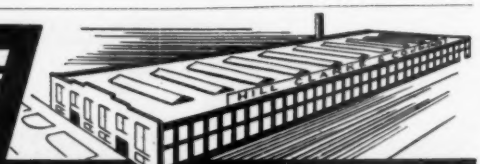

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1 Spdl—26" Sw—No. 2 LMS L.G. Hyd.
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2 Spdl—24" Sw—No. 2 Avey matic
3 Spdl—15" Sw—No. 2—MA 6—Avey
4 Spdl—24" Sw—No. 3 Avey
6 Spdl—14" Sw—No. 2 LMS L.G. Hyd.
No. 112 Defiance

GEAR MACHINES
No. 61-A Fellows Gear Shaper (1942)
No. 7 Fellows Gear Shaper (1942)
No. 72 Fellows Gear Shaper
No. 72-A Fellows Gear Shaper (1942)
11" Gleason Bevel Gear Generator
12" Gleason Bevel Gear Generator
No. 13 Brown & Sharpe Spur & Bevel
No. 1 Whiton Auto. Gear Cutter
No. 6 Gleason Bevel Gear Tester (1942)

BORING MACHINES
No. 21 Lucas 3" bar, M.D.
3" Bar Universal Horizontal Boring
Rockford—3½" Bar
No. 2 Lambert 4" bar
24" Bullard New Era
42" Bullard New Era
42" King
60" Colburn, M.D.
72" Niles-Bement-Pond

GRINDERS
J"x12" Brown & Sharpe No. 5 (1944)
4"x12" & 4"x18" Landis, Model H (1942)
6"x18" & 6"x30" Norton Type C Plain (1943)
10"x48" Norton Type C Plain (1943)
10"x72" Landis Type C Hydraulic
Norton Motorized Grinders ranging from 6"x32" to 24"x144"
No. 104 Rivett Univ. Gdr. (1943)
No. 5 Bryant Internal Grinder
No. 34 Abrasive Surface Grinder (1943)
No. 22—12" Heald Surf. Gdr.
No. 25-A Heald Surface Grinder
No. 72-A-3 Heald Internal (1942)
No. 72-A-5 Heald Internal (1942)
No. 72-A-5 Heald Extended Bridge Internal
No. 24-26 Bryant Internal Gdr.
No. 81 Heald Centerless Internal

LATHES
18"x8' American Gdr. Head, M.D.
17"x8' LeBlond, Cone Hd., M.D.
18"x8' American Gd. Hd.
36"x16" Betts—Bridgeford Grd. Head
10"x22" Sundstrand, Model AA (1943)
Model R-14 Seneca Falls Lo-Swing
No. 4R Libby (1942)
18" Libby, M.D.
No. 3-A Warner & Swasey, Bar

MILLING MACHINES
No. 3B Milwaukee Plain
No. 3 Cincinnati H.P. Universal
No. 4 Cincinnati H.P. Plain
No. 08 Cincinnati Vert.
No. 2½-B Milwaukee Vert.
No. 2 Cincinnati Dial Type Vertical (1941)
No. 3 Cincinnati H.P. Vertical
No. 1-16 Cincinnati Mig. (1942)
No. 2—18" Sundstrand-Electromil (1942)
No. 2—24" Sundstrand Electromil (1942)
No. 4-48 Cincinnati Hyd. Tracer (1942)
No. 45-48 Cin. Hyd. Tracer (1941)
6"x36" Lees-Bradner—Model LT (1943)
12"x54" H.T. Lees-Bradner Thread Miller (1943)
10"x48" Hanson-Whitney Thread (1942)
48"x24"x12' Ingersoll Slab Miller, 4 Hds.
36"x24"x12' Ingersoll Duplex Miller (1946)
36"x36"x12' Ingersoll, 3 Heads

MISCELLANEOUS
18" Dill Slotter
No. 8 Armstrong Band Saw
18" Newton Slotter
10"x10" Rassmussen Saw, Stock Fd.
4" Toledo Pipe Machine (1944)
No. 0 Bakewell Tapper
Baush Radial Tapper
Model H-7 Micromatic Vert. Hone, 1 Spdl.
Model H-702 Micromatic Vert. Hone, 1 Spdl.
Model 200 Micromatic Horiz. Hone, 1 Spdl.
Model H-2 Micromatic Horiz. Hone, 2 Spdl.

PLANERS
36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 Hds.
42"x42"x10' Cincinnati 2 hds.
48"x36"x14' Gray
48"x48"x12' Cincinnat, 4 Heads

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CRANE—150 Tonx30' span, Whiting, Bridge, plus 2 Aux. Hooks 25 ton (will widen to any span).
CRANE—Shepherd 3 Ton x 30' span, floor control.
CRANE—75 Ton x 58' span (extension to 70') (1942).

BORING MILLS—D & H 3½" horiz. floor. Vertical Turret Lathe 30". Bullard 72", 2 swivel heads on rail (old).

HYDROHONER—Model H4 Micromatic.

DRILL PRESSES—Minster #2D, 2½" cap. Hvy. Snyder, 1½", 28" swing.

GEAR SHAPERS (2)—Fellows #6

FURNACE CONVEYOR—72"x24"x34' Electric & Gas at 900° F.

LEPEL—7½ KW Induction heat unit (late).

LATHES—Engine, Logan, g.c., 10"x4' cabinet. Engine, L & S 16"x30" C. Geared Head. Turret, Foster #1B Universal, Chucker. Turret, Midland #5 Univ., 2½" bar & chuck (1942).

MILLERS—Newton Vert. 42" Rotary Hvy. Cinc. #3 Vert. Hi Power Br. & Sh. #3 Universal

PUNCH—Sq. end, Smith 1-1/16" thru ⅝".

ROLLS—Angle—Bertsch 3"x3"x⅜".

ROLLS—Bending—H. & J. 30'x¾", Pyr. Southwark 15'x3", Vert. Farnham 10'x⅜" radius.

SHEARS—Square—Famco Power 36"x18g (new). Square—Pexto 10'x10g. (1943). Alligator (#2) 24" blade, 3" Rds. Rotary—Quickwork #50A, 48"x¾" (Late).

SHAPER—Cincinnati 24" b.g.

SPOT WELDER—75 KVA Federal.

THREAD MILLS — Morey 12"x10' Centers (late). Lees-Bradner 9"x36" centers.

THREADER—Bolt—Acme 2½" cap.

PRESSES—Z & H #7, 50 ton percussion. Bliss #78½, 450 ton, 18" stroke.

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#25A—24" Heald & 12" Arter Rotary Surface
#44 & #46 Excello Carbide Tool
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Production, 4 x 60 & 6 x 12 Lo-Swing Turret, #5 B & O, #3A Warner & Swasey

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0-8 Cincinnati Vertical
1-8 Kent-Owens Prod. Mill
3V Van Norman, vertical
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Giddings & Lewis No. 0, 3" cap. (2)
Giddings & Lewis No. 32, 3½" cap.
King 42" & 72" Vert. 2 rail heads
Lucas No. 31 Precision, 3" bar
Niles-Bement-Pond 4" Bar
Niles-Bement-Pond 4½" Bar
Niles-Bement-Pond 60" Vert.

DRILLS AND RADIALS
American 6'13", 5'11"
Buffalo #2 Motor Spindle
Canedy-Otto 3'-9" col.
Defiance #112, 21" Production type
Fosdick #5 BM, #3 taper
Natco B2 24 spindle
Sibley 24" & 28"

ENGRAVERS
Gorton #1A 2 Dimensional
Gorton #3B 3 Dimensional

GEAR EQUIPMENT
Barber-Colman #12 Hobber (2)
Brown & Sharpe #13 Cutter
Fellows High Speed Shapers #7, 712, 72, 725
Flather 72" Cutter
Gleason 3" Straight Bevel Generator
Gleason 11" Bevel
Gleason #4 Angular Bevel Tester
Gleason #2 Surface Hardener
Gould & Eberhardt 36" Cutter, Univ.
National Broach Red Ring Lapper
Schuchardt & Schutte #1 Hobber

GRINDERS, MISCELLANEOUS
Brown & Sharpe #5 cyl.
Brown & Sharpe #1, #3 Univ. #13 Tool
Cincinnati #2 Centerless
Cinn. 12 x 48" Univ., Gardner #226, 30" disc.
Covel #91A Univ. Tool & Cutter, Hammond #4
Heald 72A3 Int. Centerless Sizematic, #1 Tool

Landis 10" x 24" Univ., Latest, #6 Thread
Landis 6" x 30" Type C Cyl.
Norton #2 Tool & Cutter 6"x18", 6x30" Type C cyl.
Oliver #510 Drill Pointer, Sellers 4G, Black Diamond
Porter Cable Belt WGB, G8; Grenby Int.
Pratt & Whitney Radius #R6, K.O. Lee Tool

GRINDERS, SURFACE
Abrasive 8 x 24", #33, #34 Vert., 3B
Blanchard #16, 30" Mag. Chuck, #11—16" chuck
G & L #25, 6" x 18"; #45, 12" x 24" Hyd. Feed
Heald 22—12" chuck, Arter 12"
Norton 6 x 18" Hyd., 10 x 36"
Pratt & Whitney 12 x 36" Vert.
Reid #2A P.F. Motor in Base
Thompson Hyd. 6 x 10 x 18", 6 x 12 x 18"

LATHES
American 20" x 8' Bed G.H. Lathe
#2A Duomatic, Like New
Fay Automatic 12" x 81"
Hardinge Precision 9", 1" Collet Cap., Rivett
Hendey 12 x 30" T.A., collets, etc.
Hendey 14" Yoke Head Lathes
LeBlond Regal 10" x 3' bed
Lodge & Shipley 20" x 54"
Lodge & Shipley 14" x 30"
Putnam 36" x 22'
Putnam 42" x 17'
Sebastian 12" x 4' G.H.
South Bend, 10 x 4
Wickes 32" x 35' Geared Head

MILLS, PLAIN, UNIVERSAL & PROD.
Brown & Sharpe #000, 12, 21, #2A Univ.
Burke #4 Plain & Univ. Vert. Hd.
Cinn. 08 PL & Vert.—Rise & Fall
Cincinnati 1-18, 2-18 Mfg., #2M Plain, 1M Univ.
Cincinnati #4, Univ. High Power
Kent Owens IV
Sundstrand 000 Rigidmil; Whitney Hand Mills
U. S. Multimills, MMI, Duplex

MILLS, VERTICAL
Cincinnati #4, 08 Vert.
Gorton, 8½D Duplicator
Morey #12M Profiler, 2 sp.
Pratt & Whitney #2 Jig Borer

PRESSES
Bliss 650 HI-Production Presses
Bliss 20, OBI, 58, 62, 162 OB.
Bliss 4½ Double Action, Roll Feeds
Bliss #78½, 330 Ton
Bliss 3½A Double Action Toggle
Ferracute EG54, 400 Ton Knuckle
Henry & Wright 100 Ton, 1943, Feeds
Niagara A13¾, O.B.I.
Toledo 400 Ton Knuckle Joint #663
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing

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500 Ton Lake Erie, 35" x 36" Platen 36" stroked opening
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80 Ton Wilson Press, 51"x24" Platen, 11½" St. 13" opening
50 Ton Hannifin, 20' St. 30 x 22 Bed—24" opening
35 Ton Oil Gear Straightener
50 Ton Stokes Molding Press
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GRINDER—Landis 10"x36" Plunge
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GRINDERS—Milwaukee Face Mill "C"
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LATHE—Sundstrand 8" Auto. Stub
LATHE—L & S 24"x80" Ctrs. QCG
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Gleason Cutter, m.d.
No. 2B Sellers Drill, m.d.
No. 12M Grand Rapids Tap, m.d.
No. 4T Sellers Tool, m.d., latest
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Barber-Colman Model HRS Combination Cutter Sharpener, m.d., late
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No. 2 J & B Tap Grinder, m.d.
Pratt & Whitney Deep Hole Drill Sharpener, m.d.

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3A Lodge & Shipley Duomatic, m.d., late
Cabourne Mfg. Bench Type Speed Lathe, m.d.
W. C. Lips Carbomatic Lathe, m.d.
No. 4 LeBlond Boring Lathe, 37" bed, 13" hole
No. 9, 12 LeBlond Multi-Cut, m.d.
3½x36", 3½x80", 4x60", 8x84" LeSwing, m.d.
8x132" LeSwing, m.d., latest
9x12" Sundstrand, s.p.d.
11x18" LeBlond Rapid Production, m.d.
12x18" centers Monarch Model 3T, m.d.
13"x24" LeBlond Rapid Production, Timken, latest
13"x24" Coulter Automatic Threading, m.d.
13x36" LeBlond Rapid Production, Timken, latest
13x48" Coulter Automatic Threading, m.d.
16"x6' LeBlond Rapid Production, m.d.
16"x6' Lodge & Shipley Simplified Mfg., cone, motorized
17"x6' LeBlond Automobile Mfg., cone
17"x8' LeBlond Automobile Mfg., cone
20"x8' LeBlond Mfg., m.d.
21"x8' LeBlond Turret Lathe, cone
Niles-Bement-Pond Quartering Machine, m.d., new
30"x10' LeBlond Turning Lathe, cone
Schauer Type NA 2B Speed Lathe, m.d.
Reid Bros. Small Piece Lathe, m.d.

ENGINE LATHES

10"x20" centers Monarch Geared Head, m.d.
12x24" LeBlond Regal Geared Head, m.d.
12x30" centers Monarch Geared Head, m.d.
12"x6' Lodge & Shipley Geared Head, m.d., taper
13x30" centers Pratt & Whitney Model B, m.d., taper
13x48" centers Pratt & Whitney Model B, m.d.
14x30" Lodge & Shipley Selec. Head, m.d., latest
14"x6' bed Hendey Geared Head, m.d., taper
14"x6' Lodge & Shipley Geared Head, m.d.
14"x6' Pratt & Whitney, cone
14"x6' LeBlond, cone
14"x6' Sidney Geared Head, m.d.
14"x8' Springfield Geared Head, m.d., taper
14"x8' Prentice, m.d., taper
14"x8' Pratt & Whitney, cone
14"x8' Sidney G.H., m.d.
15"x6' LeBlond Geared Head, m.d.
16"x36" Pratt & Whitney Geared Head, m.d.
16"x36" centers Pratt & Whitney, cone, motorized
16"x8' Bradford, cone
16"x8' Hendey Geared Head, m.d.
16"x8' Hendey Yoke Head, taper
16"x8' bed LeBlond, cone
16"x8' Lodge & Shipley Selec. Head, m.d.
16"x8' Lodge & Shipley, cone
16"x8' bed Monarch Geared Head, m.d.
16"x8' Lodge & Shipley, cone, motorized
16"x8' Sebastian, cone
17"x8' LeBlond Geared Head, m.d.
18"x42" centers Lodge & Shipley, m.d., taper
18"x5' LeBlond Geared Head, m.d.
18"x8' bed Lodge & Shipley, cone, motorized
18"x6' Monarch Geared Head, m.d.
18"x6'6" Greaves-Klusman Geared Head, m.d. in leg
18"x7' Hendey Geared Head, m.d., taper
18"x8' American Geared Head, m.d.
18"x8' bed Boye & Emmes, m.d., taper
18"x8' Champion, cone
18"x8' Hendey Geared Head, m.d.
18"x8' Lodge & Shipley Selec. Head, m.d.
18"x8' Lodge & Shipley, cone
18"x8' Whitcomb-Blaisdell Geared Head
18"x10' Bradford, cone, motorized
18"x13' centers American Geared Head, m.d., late
19"x8' LeBlond, cone
19"x8' bed LeBlond Geared Head, m.d.
20"x48" centers LeBlond Geared Head, m.d., latest
20"x8' American Geared Head, m.d., taper
20"x8' Cleco, cone
20"x8' Greaves-Klusman Geared Head, m.d. in leg
20"x10' Sidney Geared Head, m.d.
22"x70" centers Greaves-Klusman Geared Head, m.d., taper
22"x8' Lodge & Shipley, cone
22"x10'9" Greaves-Klusman, cone, motorized
22"x14' bed American H.D., m.d., taper, late type
23"x12' LeBlond Geared Head, m.d., taper
24"x10' American, cone
24"x10' Greaves-Klusman Geared Head, m.d., taper
24"x10' Lodge & Shipley, cone
24"x12' Bridgeford Geared Head, m.d., taper
24"x12' bed Hendey Geared Head, m.d., taper
24"x12' LeBlond, cone
25"x10' LeBlond, cone
26"x8' Bridgeford Geared Head, m.d.
30"x12'6" Niles-Bement-Pond, m.d., taper
30"x13'9" Niles-Bement-Pond, m.d.
33"x12' Greaves-Klusman, cone, motorized, taper
36"x36'9" Niles Heavy Duty, m.d., latest, 2 carriages
36"x38' American Triple Geared Internal Face Plate Drive, m.d., taper
48"x12' bed American, m.d.
Rivett 1020 Cabinet Lathe, m.d. in base, taper, very late type

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Milling Machines—No. 1 Universal, No. 1 American (new) plain, No. 1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

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Lathes—14"x8', 8', 10'—16"x6', 8', 10'—18"x6', 8' 10'—24"x10'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized. Large stock 19" and 18" bench and floor type.

Planers—Single head 24"x8', 24"x8', 36"x8'.

Shapers—16", 20", 24" B.G. crank.

Turret Lathes—J & L 2"x24"—3"x36" also Acme, W & S Turret (vertical) boring and facing mills, 8 hole turrets, 30", 42".

SPECIAL—New totally enclosed dust proof, fan cooled ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¾" from center of shaft to flatted top (1 h.p. to 15 h.p.) 3 or 3 phase, 3600 r.p.m.

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Drill—Foote-Burt No. 25 24" Hi Duty 3" capacity in steel. Motor attached.

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THE OSBORNE & SEXTON MACHINERY CO.
P. O. Box 88 — Columbus 16, Ohio

LATE MODEL MACHINE TOOLS . .

AUTOMATICS

No. 49 New Britain Chucker, 1941.
20"x29" Fay Automatic, 1942.
9/16" A Cleveland, 1943.

BORING MACHINES

No. 40 Heald Single End, 1942.

DRILLS

No. 26 HG Baker Hyd, 1942.
No. 2 LMS Leland Gifford Hyd, 1942.

GEAR EQUIPMENT

No. 645A3 & 81A Fellows Gear Shaper, 1943.
No. 72 Fellows Gear Shaper, 1943.
No. 6 Gleason Revacycle, 1940.
No. 6 Gleason Testers, 1942.
8" Red Ring Internal Shaver, 1942.
Red Ring Universal Tester, 1942.

GRINDERS, CYLINDRICAL

10"x30" Cincinnati Plain H.D. 1942.
12"x36" Landis Universal, 1942.
10"x18" Norton Plain, 1942.
6"x16" No. 10 Brown & Sharpe Plain, 1943.

GRINDERS, SURFACE

30"x24"x182" Mattison Hyd, 1943.
14"x36" Pratt & Whitney Vert, 1943.
8"x24" Thompson Hyd, 1942.

GRINDERS, INTERNAL

No. 24-36 Bryant Hyd, 1943.
No. 172 Heald Hyd, Gap, 1940.
No. 72AA & A3 Heald Hyd, 1943.
No. 73 Heald Airplane Cyl, 1942.

GRINDERS, THREAD

No. 35A Exeello, 1943.
No. 39A Exeello Int, 1942.
No. TG 615 Jones & Lamson, 1942.

LATHES, ENGINE

36"x396" American M.D.
16"x54" Reed Prentice, 1942.

LATHES, PRODUCTION

No. 3FV Vestar "Fasturnatic", 1942.
No. 3A Lodge & Shipley "Duomatic", 1943.
8"x108" LeBlond Semi-Auto, 1942.
No. 4D Potter & Johnson, 1941.

LATHES, TURRET

8¼"x24" Acme Univ, 1943.
No. 5.0 Acme Univ, 1943.
No. 1H-5 Libby Univ, 1942.
No. 6R Denver Univ, 1942.
No. 3 Bardons & Oliver, 1940.
No. 2 Warner & Swasey S.P.

MILLS, PRODUCTION

No. 34-36 Cincinnati Hydro, 1942.
No. 1-18 & 2-24 Cincinnati, 1942.
No. 1-14 Kent Owens Hyd, 1942.
No. 6B Plain & R & F Class, 1941.
No. 2 Sundstrand "Electromil", Late.

MILLS, THREAD

6"x30" LT Loss Bradow, 1942.

MILLS, UNIVERSAL

No. 3 Cincinnati D.T. 1945.

MISCELLANEOUS

2½" Etna Hyd. Cut-Off, 1944.
48"x½" Niles Plate Straightener.
No. 618 Cleveland Rigidturner, 1942.

PRESSES

300 Ton Lake Erie Hyd, 1945.
50 Ton Denison Straightening, 1942.

SHAPERS

24" Rockford H.D. Hyd. Latest.
6" Pratt & Whitney Vertical, 1942.

WELDERS

150 KVA Federal Seam, 1945.
100 KVA Taylor-Winfield Seam, 1943.
60 KVA Sciaky Spot, Like New.

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PRECISION BORERS

Two No. 2112 Excello single end, 2 spindle
One No. 112C Excello single end
Two No. 218 Excello heavy, double end
One No. 42 Heald heavy 2 spindle, work rotating type

HORIZONTAL BORING MILLS

3" bar Universal, No. 3A
3¾" bar Lucas, No. 32
4" Niles Bement Pond floor type
4½" bar Lucas, No. 33
5" bar Jones planer table type

VERTICAL BORING MILLS

24" Bullard vertical turret lathe
38"-44" Niles vertical turret lathe
52" King
84" Gisholt
100" Niles Bement Pond extra heavy

GEAR HOBBERS

No. 12 & type T Barber Colman
No. 8H, 12H, 16HS & 18H Gould & Eberhardt
No. 130 Cleveland Rigidhobber
Nos. 1 & 5A Lees Bradner
No. 7125A Fellows gear shaper

GRINDERS, CYLINDRICAL

6"x18", 10"x18", 10"x36" & 14"x36" Landis hydraulic
6"x18" No. 10 & 6"x32", No. 11 B & S mechanical
10"x24" & 16"x72" Landis mechanical
10"x36" Norton hydraulic semi-automatic
10"x18", 10"x30" & 10"x50" Norton mechanical

GRINDERS, SURFACE

Nos. 10, 16 & 16A2 Blanchard rotary
12" & 16", No. 22 Heald rotary
16" & 24", No. 25A Heald rotary
8" Pratt & Whitney rotary (tub)
8"x24", No. 34 Abrasive vertical
14"x36" Pratt & Whitney vertical
8"x24", No. 78 Wilmarth & Morman
8"x22", No. 3 Abrasive

GRINDERS, TOOL & CUTTER

Oliver template tool bit
Nos. 1 & 4T Sellers
Gisholt for lathe & planer tools
No. R6 Keller radius tool
18" Whitney wet tool
No. 13 Brown & Sharpe univ.
30" Ingersoll face mill

ENGINE LATHES

14"x6', 18"x6' & 20"x8' Lodge & Shipley
16"x5' Sebastian
16"x10' American
18"x8' Rockford
25"x48" centers Leblond
26"x120" centers Wickes
30"x16' Leblond
36"x108" centers Bridgeford
40"x80" centers Leblond

MILLERS, KNEE TYPE

Nos. 2AS Milwaukee plain
No. 3 Van Norman duplex
No. 3 Oesterlein
No. 3 Kempsmith Maximiller vertical
Nos. 1-12 & 1-18 Cincinnati production

SHAPERS & PLANERS

20", 24" & 28" G. & E. shapers
20" & 24" Gemco univ. shapers
24" Columbia univ. shaper
16" Bement Miles slotter
30"x24"x6' Liberty openside planer
36"x36"x8' Gray planer
48"x48"x12' Cleveland openside planer

MISCELLANEOUS

BROACH—15 ton No. V3 Lapointe
HAMMER—No. 5N Nazel pneumatic
HONER—No. H1 Micromatic
LAPPER—No. 26 Norton Hyprolap
PRESS—1000 ton Bliss coining
RIVETER—Nos. 3A & 5A High Speed

MILES MACHINERY CO.
Box 770 SAGINAW, MICH.

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10"x20" MONARCH Model EE Toolroom Lathes
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18"x30" LODGE & SHIPLEY Selective Geared Head Engine Lathe.
20"x48" AMERICAN "Pacemaker" Multi Production Lathe.
#43 LUCAS 4½" Bar Boring Mill.
4½"x36" P&W Model C Thread Miller
No. 2HS CINCINNATI Vertical High Speed Dial Type Miller.
Nos. 2K and 3H K&T Vertical Millers.
No. 2BL NATCO "Holesteel" Multiple Spindle Drill, rectangular head.
No. ½B P&W Two Spindle Reaming Machine.
No. 2 B&O Geared Electric Turret Lathe.
No. 3 W & S Ram Type Univ. Turret Lathes.
H-3 BARNES Hydram Drill.

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Late Type
36" x 36" x 12'
PLANER MILLER
Adjustable rail, three heads, 40 HP AC Motor Drive. Excellent condition.
IMMEDIATE DELIVERY

Model W-7 BAUSH Hydraulic Multiple Spindle Drills.
20" G&E Industrial Shaper.
36" CINCINNATI H.D. Shaper, 1942
No. 3B B&S Dual Control Plain Miller.
No. 145 CLEVELAND Rigid Hobber.
#725A FELLOWS High Speed Shapers
No. 12 FELLOWS Gear Shaver.
Nos. 1LMS Leland-Gifford 6 Spindle Drills, 1942.

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NILES-BEMENT-POND PLANER

One 48 x 48" x 12' arranged for reversing motor drive and equipped with 20 HP G.E. reversing planer motor and control panel. Motor 250-1000 RPM 230 volt D.C. 2 HP G. E. motor 230 D.C. for raising cross rail equipped with two rail heads and two side heads. Distance between husings 49". Height under rail 49". Table 42" x 13'. Equipment includes motor equipment, handles and wrenches.

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3½" & 4" bar Landis Floor Type Mills
BL-2416 Keller 3 dim., 3 spin., Late
36-90 Cinci. Duplex Hydro Miller, 1942
#1404 K. & T. Simplex Miller, 48" travel
No. 4 Kempsmith Vert. Miller
No. 4 Kempsmith Vert. Miller, Timken, M. in base
No. 3 Cinci. Dial Vertical Miller, Late
No. 2M Cinci. Vertical Miller, 1942
No. 4B B. & S. Plain Miller, Late, M. in base, Timken
No. 2 Stand. K.&T. Pl. Miller, M. in base, Timken
No. 2LU Van Norman Univ. Miller, '42
5'14" col. American Trip. Purp. Radial, AC M.D.
5'12" col. American Trip. Purp. Radial, M. on arm
Barnes Combo. Boring & Honing Mach. up to 18" bore x 6' hole, 1942
48"x20'6" cen. Simmons Lathe, 1942
36"x20' cen. Niles, 2 carr., 1 T.A. AC
32"x25' cen. Sommerfeld, 2 T.A., 2 carr., 1942
22"-24½"x48" cen. Skoda Lathe, NEW
14"-16½"x54" cen. Bradford Lathe, T.A., 1943
12"x30" cen. Pratt Whitney Model B La., '43, NEW
21" Cinci. Acme Univ. Brass Lathe, 1940
26" Libby "C" Turret 4½" capty
16" Gemco Univ. Shaper, '43, like new
84" Cinci. Vert. Mill, 2 Hds., P.R.T.
60" Colburn Vert. Mill, 2 Hds., P.R.T.
48"x36"x8' Cinci. 4 Hd. Planer
24"x12' bed L. & S. Lathe, Modern
No. 1B Foster Univ. Turret Lathes (2)
No. 2 Stand. K. & T. Univ. Miller, M. in base, Tim.
No. 4 Cinci. Vert. Miller, High Power

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42"x42"x16' Gray, 3 heads direct Motor Drive.

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AMERICAN 36"x40" centers, grd; MD
AMERICAN 36"x360" centers, 2 carriages, MD
JONES & LAMSON "Fay" 24x24" Auto. Latest
JONES & LAMSON "Fay" 20x25" Auto. Latest
JONES & LAMSON "Fay" 20x55" Auto. Latest
LeBLOND 16"x10" centers Auto. Latest
LODGE & SHIPLEY 5"x24" and 96" centers Duomatic, Timken, Latest
MONARCH 16"x28" centers, grd, MD
MONARCH 22"x456" 3 carr. Tim. CM. MD
NILES "Time-Saver" 30"x50' Boring, Latest
NILES "Time-Saver" 30"x11' engine, PRT Latest
REED PRENTICE 16"x24" grd hd; MD
SPRINGFIELD 14"x43" grd hd; MD

GRINDERS—Surface

ABRASIVE No. 34 Vert. Spdle. MD; Latest
BLANCHARD No. 16A hydraulic; latest
PRATT & WHITNEY 14x36" Type B Hydr. Latest

GRINDERS—Miscellaneous

BRYANT No. 3, 6, 16-C-16, 24-36" int. hydraulic; latest
GLEASON No. 12 Tool Sharpener; Latest
HEALD 72A5 "Gagematic" Internal; Latest
HEALD No. 72A3 "Gagematic"; MD
HEALD 72A3, 72A5 Internal; Latest
K. & T. face mill grinder; Latest
LaPOINTE 60" Univ. Broach Sharpener; Latest
SHEFFIELD Micro-form Grinder; latest
THOMPSON 6x48" Auto. rd. hd. Broach; MD
VAN NORMAN 639 osc. radius; Latest
VAN NORMAN #666 crankshaft regrinder; MD; Latest

GRINDERS—Plain Cyl.

LANDIS 4x12" type H plain hydr. Latest
LANDIS 6x18" type C Pl. Hydr. Latest
LANDIS 29"x130" centers Plain; MD
NORTON 10x72" type C Plain; Latest
NORTON Mod. D-86 17x72" centers crankpin, hydraulic; latest

GRINDERS—Universal

BROWN & SHARPE No. 1, 2, 3, 4 Univ. Latest
CINCINNATI 16x36" Univ. Mod. ER Latest
LANDIS 14x48" type C Univ. Hydr. Latest

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3½" Landis Horizontal Boring Mill
#999 Van Norman Boring Bar
#3 LaPointe Horizontal Broach
Model H-3 Barnes Hydram Drill
#35 Excello Thread Grinder
16-Y-28 Bryant Internal Grinder
#612A Fellows Gear Shaper
24" Potter & Johnson Shaper
36/90 Cincinnati Hydromatic Miller
28/120 Cincinnati Horizontal Hydrotel
24"x24"x10' Whitcomb Planer

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#1 Brown & Sharpe, Hand
#2 Brown & Sharpe, Hand (2)
#4 Warner & Swasey G.H. Universal, serial #338358
#4 Warner & Swasey G.H. Universal, serial #560237
#4 Warner & Swasey G.F.H. Universal Turret Lathes (4)
#6 Warner & Swasey G.F.H. Turret Lathe, serial #288187
#7U Foster G.H. Universal Turret Lathes, 1938 (2)
#1L Gisholt Turret Lathe
#2A Warner & Swasey G.H. Universal, serial #199504
#12 Gisholt Hydraulic Automatic Turret Lathes (2)
#00, #0 and #2 Brown & Sharpe Automatics
#00 Brown & Sharpe Turret Formers, roller bearing (3)
#0G Brown & Sharpe H.S. Automatics, 11,000 serial (3)
#2G Brown & Sharpe H.S. Automatic, serial #9015
#2G Wickman Swiss Type Automatic
⅝" Model DA2 Davenport Automatics (2)
⅞" Model C Acme Automatic
⅞" Model A Cleveland Automatic
1" Model C Acme Automatic
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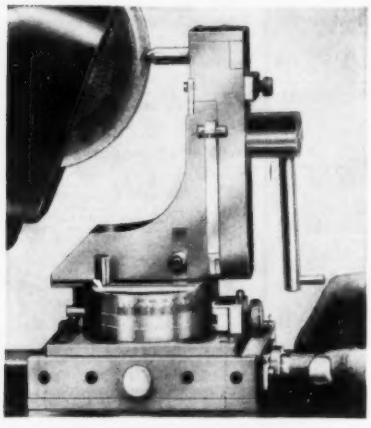

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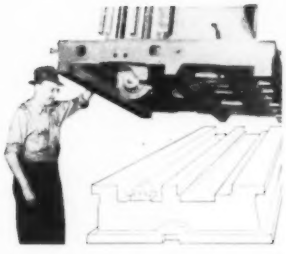
WIN *with* NO SCORE



At The Thompson Grinder Co., Springfield, Ohio, abrasive dust unavoidably present in the atmosphere made it pretty rough on the original cast iron ways of this Cincinnati Gilbert floor type horizontal boring mill. Six months was about the best service life obtainable before resurfacing the ways became necessary.

The scoring problem was completely eliminated with Cincinnati Gilbert non-metallic way blocks installed under the column base. Now, after 26 months of heavy duty service—16 hours a day, 5 days a week—the mill has maintained original accuracy—*and still no score*... This is just one of many practical reasons for specifying "Cincinnati Gilbert" on your next boring mill purchase. Write for Bulletin 1244-B... The Cincinnati Gilbert Machine Tool Company, 3366 Beekman Street, Cincinnati 23, Ohio.

THE CINCINNATI
GILBERT
MACHINE TOOL COMPANY

3366 BEEKMAN STREET, CINCINNATI 23, OHIO • RADIALS • BORING MILLS • ACCESSORIES

THOSE WHO BUY GILBERT BUY GILBERT AGAIN

Saved: $39 per 1000 pieces

BY switching from bar stock to Timken® seamless tubing for this automatic transmission part, the manufacturer cut his cost 23.7%. The saving amounted to $39 per 1000 pieces. Actual cost figures below give the whole story.

Biggest saving with Timken seamless tubing is in production costs, as the figures show. With tubing the center hole is already there; there's less stock to machine away; speeds and feeds can be increased.

Timken tubing often saves you money on material costs, as well. Although tubing costs more per ton than bar stock, it usually comes to *less* per *foot*, because of its lighter weight. This also results in lower freight and handling costs.

Switching to Timken tubing can improve the *quality* of your product, too. With tubing, internal working tools may be flooded better with coolant. As a result you get closer dimensional control and better finish. And your product has greater strength because of the fine forged quality of Timken tubing.

For maximum savings with Timken tubing, use our Tube Engineering Service. We recommend the most economical tube size for your job—guaranteed to clean up to your finish dimensions. Let our Tube Engineering Service analyze your requirements. Write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

HOW 24% WAS SAVED:

	BAR STOCK	TUBING
Material costs per 1000 pieces	$79.56	$76.77 a saving of $2.79
Freight costs per 1000 pieces	$ 3.57	$ 2.18 a saving of $1.39
Number of pieces produced per hour on 6-spindle 2⅝" capacity automatic screw machine	80	140
Machining cost per 1000 pieces (estimated machine operating cost—$6.50 per hour)	$81.25	$46.43 a saving of $34.82

TOTAL COST SAVING WITH TUBING
$39.00 per 1000 pieces, or 23.7%

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing.